RAILROAD GAZETTE

FEDERAL RATE REGULATION.

The question of Federal rate regulation has been a favorite theme for many years with the farmers of the Northwestern States and with the Interstate Commerce Commission, but this fall it received a new impetus, which started in Minnesota and Wisconsin and culminated in the President's message. The text furnished by Mr. Roosevelt, which has inspired so many sermons in the last few weeks, is as follows:

> While I am of the opinion that at present it would be undesirable, if it were not impracticable, finally to clothe the commission with general authority to fix railroad rates, I do believe that, as a fair security to shippers, the commission should be vested with the power, where a given rate has been challenged, and after full hearing found to be unreasonable, to decide, subject to judicial review, what shall be a reasonable rate to take its place; the ruling of the commission to take effect immediately, and to obtain unless and until it is reversed by the court of review. The government must in increasing degree supervise and regulate the workings of the railroads engaged in interstate commerce, and such increased supervision is the only alternative to an increase of the present evils on the one hand, or a still more radical policy on the other. In my judgment the most important legislative act now needed as regards the regulation of corporations is this act to confer on the Interstate Commerce Commission the power to revise rates and regulations, the revised rate to at once go into effect, and to stay in effect unless and until the court of review reverses it.

This paragraph from the message has been printed in the *Railroad Gazette* before, but it is well to have the President's exact words in mind, for it is foolish to ignore the fact that they are going to carry great weight with Congress. Much stress is laid upon the distinction between vesting the Commission with general authority to fix rates, which is called undesirable, and giving it power to say what shall be a reasonable rate, subject to judicial review, after it has investigated a previous rate with regard to which complaint had been made. This distinction is evidently intended to allay the fears of those who view extension of Federal control with alarm, but it is quite clear that it does not diminish the tremendous power which it is proposed to put in the hands of the Commission, for the right to make the original rate would, of course, be equally subject to review by the courts.

The objections to placing this rate-making power with Congress—for if the rates are to be established by a body created by Congress they are, of course, to be established by Congress—have been pointed out again and again. Here is a commission which cannot well contain a railroad man (the Interstate Commerce Commission never yet has contained one, and public opinion is strong that it should not), yet it must be responsible for the most technical question in regard to railroad traffic, with the all-important distinction from the work of actual railroad men, that any mistakes it makes must be paid for by some one else. Such a commission, as has been said in these columns, would have the power to destroy or to build up industries, lines of trade or communities, but would be itself subject to political appointment. After the Northern Securities decision, President Roosevelt virtually announced to the country through Attorney-General Knox, that he did not intend to run amuck, but when one considers the majority by which Mr. McKinley defeated Mr. Bryan in 1900, it is terrifying to think what the Interstate Commerce Commission might do in the hands of a president who did intend to run amuck. Corporations are always unpopular, and the railroads, as among the largest of corporations, are among the most unpopular. Suppose, for example, that the proposed power is given to the Commission, and then in 1908 some presidential candidate with Populistic tendencies bases a sensational campaign on what he is going to do to the railroads with the Interstate Commerce Commission when he gets into office—and suppose he gets into office! There is an astonishingly large number of people throughout the country who would support such a movement, and it must be squarely faced.

It still remains uncertain whether the power with which it is proposed to vest Congress through the Interstate Commerce Commission is constitutional under the fifth amendment. Mr. Aldace F. Walker, Chairman of the Atchison, Topeka & Santa Fe Board of Directors, discussed this point in 1898, and held that if a power to fix prices is derivable from the word "regulate" (in the phrase "regulate commerce"), it must apply as well to the sale and purchase as to the transportation of the subjects of commerce; and it is not perceived how any decision founded upon such a definition of the verb can stop short of including the price of cotton in its sale as well as the price of its transportation. This seems to be sound reasoning, but the point at issue is a somewhat academic one, and the risk of allowing the proposed law to be enacted without protest, on the chance of its being overthrown in the Supreme Court on the construction of a verb, is great.

What is important now is that those who believe that this centralization of Government power, with specific application to the making of rates, is highly inimical to the welfare of the country, should unite in presenting some substitute measure. It can do no good, or only a little good, to point out that the general rate situation, instead of being such as to demand attention, is in good condition, probably better than ever before; that rates, as compared with the prices of other commodities, have shown a steady decrease through a series of years (*Railroad Gazette*, August 19, 1904, page 250), and that it is better to let experts do their best in making rates that they have got to live on, and then use the courts for review, than it is to use the courts to reverse the work of non-experts who are making rates they have not got to live on. It will be only of moderate avail to compare the excellent work of the Massachusetts Railroad Commission, which has no power to make rates, with the revolutionary and socialistic regime of the commission in Texas, which has power to make rates. It seems altogether certain that popular outcry for some change in the status of Federal rate supervision will be so strong that the only way to avoid the radical fixing of vast power in the Commission will be to offer a constructive measure, in place of mere destructive criticism; a measure which will meet the objections to the present difficulties and delays which confront the shipper who believes an existing rate to be extortionate, without placing a highly dangerous power where it does not belong.

PREVENTION OF COLLISIONS.

The very general agitation of the subject of railroad accidents during the last year has resulted in three notable magazine articles; one by Congressman John J. Esch, of Wisconsin, in the *North American Review* for November; one by Secretary Moseley, of the Interstate Commerce Commission, in the *American Monthly Review of Reviews* for the same month, and one by F. W. Haskell in the *Engineering Magazine* for December.

All of these writers make sensible recommendations, but not all of them have succeeded in fully grasping their difficult subject. Mr. Moseley's article is, in large measure, a review of facts which have appeared in the Government accident bulletins and which are, therefore, familiar to the readers of the *Railroad Gazette*. Ignoring the numerous misleading expositions of alleged statistics which have been published of late, he reminds his readers that the purpose of the Commission in gathering accident statistics is not to make dreary comparisons of columns of figures, but to get at the real causes of the deaths and injuries. Mr. Moseley proposes the extension of the block system and the restriction of the use of permissive block signaling; a radical reform in the train order system or the substitution for it of the electric staff; the introduction of rigid rules governing hours of labor; a third man on the engines of fast trains; a fare collector to relieve the conductor on heavy trains, and other things.

Mr. Esch has gathered a great mass of facts, but they are not well digested. He calls attention to the need of more numerous and better-organized repair forces to insure the safety of freight trains; the danger of excessive hours of work on trains; of youthful telegraph operators; of weak cars in passenger trains, and other things. He says that the general introduction of the block system would mean a large expenditure, yet he ends up by unequivocally approving a law making it compulsory. The summary of his recommendations reads much like Mr. Moseley's, but he adds a plea for a law to prevent the employment of youthful and incompetent men; for specifications requiring mail cars to be made of steel and for the requirement of steel frames for passenger cars.

Mr. Haskell's article, like Mr. Moseley's, eliminates as irrelevant many of the points which have filled newspaper articles on this subject, and goes straight to the main question—the prevention of collisions. His proposed remedies are in the main rational, though he ignores the radical difference between the time interval and the space interval theories of running trains. When he says that "there are perhaps more rear collisions on block signaled roads" than on others, he betrays a lack of familiarity with his subject. In endorsing the view that the underlying cause of the poor discipline on American railroads is "the peculiar national unrest which chafes at all restraint," he loses himself in a glittering generality which seems to be quite popular with many writers nowadays, but which is too vague to find place in a serious discussion. "Habitual contempt of orders" is given as a cause of the forgetfulness to which were due certain well-known collisions. This is rather inexact, to say the least; Mr. Haskell forgets that some of the worst cases of forget-

fulness are found among conductors and enginemen whose minds are far removed from that unruly state which is supposed to have been fostered by trade union influences and the disposition to rush things.

In his principal conclusion, Mr. Haskell sees straight; the universal need, he says, is for moral fiber in both officers and trainmen; with good discipline, carefully maintained, many of the delinquencies which now make up our terrible record could be done away with. The trouble with this recommendation is that no one has discovered any way by which to make railroad companies carry it out. The *Railroad Gazette* has preached this doctrine from time immemorial, but the great majority of the sinners seem still to be blinded by their own hardness of heart. In this situation the only recourse, as the readers of the *Railroad Gazette* have many times been told, is to make a radical change of system. The space interval would be the only rational *system* to advocate, whatever might be the state of the discipline or the condition of the men's moral or mental qualifications on any given railroad. This system requires competent men, and its advocates do not ignore the need of excluding the incompetent; but it remains true that, regardless of the question of individual competency, the system itself is the safest one. When Mr. Haskell says that without an improvement in the moral character of the men the advantage derived by the introduction of safety devices is more than counteracted by "the resulting division of responsibility," he is very wide of the mark. It is true that the continuance of the flagging rules where the block system is in use tends to impair the integrity of the block system; but even with this handicap, the system still maintains its superiority.

Mr. Haskell makes recommendations like those of the other two writers, and adds some technical details concerning train rules on single track. In proposing that trains shall not meet except at telegraph offices he is asking what many roads will not do without compulsion; and if they are to be compelled to keep operators on duty at all meeting places they may as well be compelled to use the block system. His other recommendations may be termed complicated remedies for evils which the block system would cure without complication. Evidently he has omitted to recommend the block system because of unfamiliarity with its simplicity and cheapness.

Now, we have called these magazine articles notable because their authors, all aiming to promote the general welfare, have studied their subject deeply and have made intelligent recommendations; two essential features, which, used as tests, compel the rejection of most of the articles on the prevention of accidents heretofore printed. Except among railroad officers, thorough students of the subject are rare, and those whose conclusions are both practicable and public spirited are rarer. But the articles now before us, will, we fear, fail to impress the Congressmen, editors and statesman for whose attention they have been prepared, because the fire of their guns is too much scattered. Questions of sound rails, substantial roadbed, strong cars and improved discipline cannot be lumped together and settled at one time. There are too many differences of opinion and financial or other practical obstacles. The one point now pressing for consideration is the prevention of collisions; and this, as we have said, involves first of all a change of system. Ask any candid railroad superintendent how he is going to improve his safeguards against collisions without introducing the block system and his answer will convincingly show that this is the case; that his problem is complex in the extreme. He must see that all his flagmen are A1, yet he cannot dismiss the doubtful ones; he must try to educate them—a slow process. He must "jack up" the vigilance and intelligence of his conductors, but will find so much prejudice and narrow mindedness that he will have to be careful to avoid stirring up the grievance committee. When he tries to improve his enginemen he will find that 25 to 50 per cent. of them have lately been promoted from the fireman's side without adequate training; this because business has been increasing so fast. We will not here take account of the fact, said to be patent on many roads, that in consequence of the severe physical strain of firing the largest engines the average intelligence and moral character of the firemen has notably deteriorated; good men will not take such jobs. The superintendent will desire to improve his telegraph operators but will find that his appropriation is so small that his best men will resign their places about the time that they have become thoroughly trained. He will find that trainmen who have passed well in a "school" make mistakes in actual work, necessitating the appointment of inspectors, travelling instructors and conscientious men to do surprise checking; and that on his whole road he cannot pick up enough competent men to do this work for his one division. After he has found them it will require much courage to put them on the pay roll, because of the strong feeling that the next great collision will happen on some other road.

These are a few of the superintendent's troubles. There are plenty more. While no sensible superintendent can think of abandoning the hope of some time getting rid of these defects in the personnel, many (who besides being sensible have more than average courage) have concluded that the process is so slow, and the demands of the time-interval and train-order system are so exacting, that the Gordian knot had best be cut by the adoption of the block system; and they have so cut it. But others still sit with folded hands. This condition has continued now for years and the public begin to see it in its true light. The time is surely com-graph Company versus the Pennsylvania ing, and should not be far distant, when a definite measure to make block signaling compulsory on lines subject to certain traffic conditions, will be brought before Congress. In spite of the grave and patent objections to governmental interference with railroad operation, the collision evil must be squarely met, and the only way of accomplishing this seems to be to extend the Safety Appliance act of 1893 to include the block system; which is one of the most effective of all safety "appliances."

Metal Cross-Ties in Austria.

We are indebted to Mr. Hermann von Schrenk, Chief of the Forestry Bureau of the Agricultural Department, for some valuable statistical tables relating to the comparative economy of steel and wooden ties on a prominent railroad of Austria, from the reports of the Chief Engineer of the road. These tables are too voluminous to be printed here in full, but an abstract of the figures will serve to give the important facts and deductions.

In 1883 a length of 1.25 miles of main track was laid with steel ties of the Heindl type, and these have been continued in use since that time. At the same time a length of about 3½ miles of track was laid on wooden ties, which have since been maintained. Accurate and detailed account was kept of the cost of track maintenance on these two sections, and the tables before us give these accounts for the years 1884 to 1902 inclusive. The Heindl tie is of the modified inverted trough type and those here referred to were of the class A, or heaviest section made. Their length is 7.57 ft., top width 6 in., and bottom width 10.4 in. Their depth is 4 in. The thickness of top plate is 0.4 in., and the thickness of the sides varies from 0.32 in. to 0.28 in. The area of metal in the cross section is 5.69 sq. in., and the weight of each tie is 158 lbs. They are spaced in the track about three feet from center to center, except at the rail joints, where they are nearer together. The first cost of these ties with their rail-fastenings, etc., is given as $3.82 each. The rail in use on both sections weighs about 70 lbs. per yard. The wooden ties were 8.2 ft. long, 6 in. deep, with sloping sides, the bottom width being 11¾ in. No information as to the kind of wood, the spacing of the ties or their cost, is before us, but the average spacing seems to be 2.8 ft. It is usually estimated that in that country the cost of wooden ties is about one-half that of steel ties. About one-half the track on the steel tie section is ballasted with broken stone and the other half with "sifted" ballast, while the whole of the wooden tie section is on "sifted" ballast.

Data as to weight of rolling stock is not at hand, but it is probably about the same as on some other Austrian roads, where the passenger locomotives weigh about 35 tons, with about six tons on each driving wheel, and the freight locomotives weigh about 40 to 45 tons with about seven tons on each driving wheel. The maximum speed of passenger trains seems to be about 45 miles per hour. The tables before us show that during the 19 year period the total traffic was as follows:

	Sections	
No. of trains:	Steel tie.	Wooden tie.
Express	38,294	38,331
Passenger and mixed	43,923	44,068
Freight and express	150,042	150,007
Total	232,259	232,406
Total tonnage	129,430,000	129,360,000

Each section was therefore subjected to practically the same burden.

Some of the more important facts relating to the track endurance are given in the following table:

Table 1.

	Ties	
	Steel.	Wood.
Length of track observed, miles	1.25	3.51
No. rails renewed in 19 years:		
Because of wear	77	125
Because of breakage	80	57
Total	155	182
No. rails removed per mile of track	124	52
No. rails broken per mile of track	64	13½
No. of ties used on section	2,246	6,610
No. of ties renewed in 19 years	4	7,086

The most striking thing here shown is the great discrepancy between rail failures per mile over the two kinds of ties. How far the wearing-out of rails was due to the ties cannot be determined, but the fact that the breakages were, during the period of 19 years, 64 rails per mile on the steel ties and only 13½ on the wooden ties, is the best evidence of the comparative support offered by the two kinds of ties. When it is remembered that this trough-shaped steel tie is only 4 in. deep, and that the section is one that gives very little stiffness for the quantity of metal used, the excessive rail failure

is not surprising. This same lack of rigidity will help to account for the remarkable endurance of these ties. At the end of 19 years only four out of 2,426 of them had failed, and these were reported as worn out, not broken. We should expect such a tie to bend rather than to break.

The statistics of cost of track maintenance on the two sections are not very clear on some points, possibly because we do not fully understand them. They are abstracted and condensed in the table that follows:

Table 2.

	Ties	
Cost of maintenance per mile for 19 years:	Steel.	Wood.
Wages	$1,453.30	$1,284.60
Materials, incldg. rails & blst	250.56	1,350.67
Ballast for repairs	14.00	11.47
Total	$1,717.86	$2,646.74
Cost per mile per year	$90.41	$139.30
Ballast, renewal per mile pr yr	58.07	46.13
Renewal, rails per mile per yr.	10.74	4.44
Total, cost per mile per yr	$159.22	$189.87

From this it appears that the cost of maintenance was apparently materially less with the metal ties than with the wooden ties. But such a conclusion is erroneous for the reason, principally, that no part of the first cost of the steel ties enters into the computation, while the cost of wooden ties for at least one renewal is charged to maintenance. The figures given for cost of rail renewal do not seem compatible with the excessive rail failure, nor do they seem to be in harmony with the ratio of rail failure on the two kinds of track. If these rail failures per mile were as 64 to 13½, it is difficult to see how cost of rail renewals could be as $10.74 to $4.44 per mile. There are many other discrepancies in the tables which seem to require explanation. Whatever may be the comparative advantages of the steel tie on this road, it seems obvious that the one used is deficient in strength and rigidity, even for the comparatively light rolling stock of the Austrian railroads.

Railroad Hospital Departments.

The railroad hospital idea originated in the West, and was the natural outcome of the conditions which attended the building and working of railroads through sparsely inhabited regions. With few large towns on the line, and these widely separated, a road would probably be without a single public hospital on its entire route. Some means of caring for injured passengers and sick and injured employees was a necessity, and the establishment of hospital service under railroad management was the result. It is not generally known that this measure of public service was inaugurated as far back as 1868, and the first hospital devoted exclusively to the care of railroad employees built the following year. To the Southern Pacific belongs the credit of being the pioneer in this movement; or, to be more exact, the old Central Pacific, for the hospital referred to was built at Sacramento. Some years later this road's example was followed by other large western systems, the Missouri Pacific next adopting the idea, and then the Santa Fe. Since that time the Wabash, Northern Pacific, 'Frisco, Plant System, Chesapeake & Ohio and Toledo, St. Louis & Western have established hospital departments and built from one to three hospitals each, while small hospitals have also been built by some of the Texas roads. The service in most, if not all, of these cases is maintained by hospital associations, which derive their funds from the employees by means of regular assessments, dependent in amount upon the salary each receives. In some cases the associations were formed, and are directly administered, by the railroad management, while in others they are entirely independent organizations. The Southern Pacific and other early associations are of the former type, but the employees were quick to realize and appreciate the benefits which the small monthly contribution assured them, and made no objection to the compulsory assessment. It has been said that in the absence of such hospital service as this system makes possible, many of the employees would probably pay out during a year to sick or unfortunate fellow-workmen more than they contribute to the hospital fund. The railroad companies also contribute generously to the fund and make up any deficiencies.

Although it would naturally be expected that a large railroad system with thousands of employees would have a good many patients on its hospital list in the course of a year, the following figures given by Dr. F. K. Ainsworth, Chief Surgeon and Manager of the Southern Pacific Hospital Department, in a paper presented to the Pacific Coast Railway Club, will surprise the uninformed. The figures are for 1903:

Southern Pacific (Pacific System)	58,220
Missouri Pacific	42,084
Atchison, Topeka & Santa Fe	39,171

The figures appear the more remarkable when it is known that the number of employees of the Southern Pacific, for instance, is upwards of 40,000, the ratio of cases treated to number of employees being therefore 165 to 100. Dr. Ainsworth also gives figures on the cost of this service, which for the first half of the last fiscal year amounted to about $129,000. The receipts were under $121,000, leaving a deficit of about $8,000. Conspicuous items on the list are: Salaries of surgeons, $20,210, and fees of emergency surgeons, $4,344. The surgeons of the department are paid in three ways—by transportation alone, by transportation and salary, and by fees. The latter are paid to emergency surgeons only; that is, surgeons at smaller points, where the service is irregular. For the $4,344 paid out in this way 1,276 visits were made, at an average cost of $3.40 a visit. Dr. Ainsworth says that if the regular surgeons were paid by fees as the emergency surgeons are, the cost for the same period would have been $331,000; but for the amount actually paid —$20,210—these surgeons realized an average of 20 7/10 cents a visit. In San Francisco the average is even much lower. Operations that in private practice command anywhere from a few hundred to many thousands of dollars, are performed for about 10 cents. Of course, the value of the transportation is not included in these estimates, but according to Dr. Ainsworth most of the surgeons rarely make use of their transportation. To those who have an impression that surgeons in railroad service receive high pay in proportion to the work they do, these figures will be illuminating.

The paper advocates the establishment of small emergency hospitals at shops and yards and at enough other points to insure prompt care to the seriously ill or injured and avoid the danger of moving such cases a long distance to the main hospital. This provision, it says, would be the means of saving many lives on western railroads. It is, of course, unnecessary on eastern lines, traversing thickly populated districts.

Some of the hospital associations maintain wards in public or private hospitals at important points along the line, as adjuncts to their own hospitals. A feature of the Northern Pacific Hospital at Brainerd, Minn., is a training school for nurses.

The trunk lines, and the other railroads in official classification territory, through their bill of lading committee, have announced that the date for putting the proposed new uniform bill of lading in effect has been postponed until April 1. This action appears to be the result of the hearing held by the Interstate Commerce Commission at Chicago last week. The agitation of this matter in the newspapers during the past few months has all the time appeared to be little more than a tempest in a teapot, and the present result indicates that appearances were correct. There were only two grievances worth mentioning, and the representative of the railroads seems to have been right in asserting that even these two would not have amounted to much but for the abnormal activity of two or three self-appointed shouters for the shippers. The first grievance was based on the threat to add 20 per cent. to what have been generally accepted as normal freight rates unless the shipper, by a written agreement for each shipment, would assume his own risks of damage on fragile articles or things not properly packed, and the second on the "not negotiable" clause. The railroads have practically backed down on both points. As to fixing bills of lading so that the shipper could not use them as a draft to get money on his goods through the banks, it is now asserted that there was never any intention of doing it; the "not negotiable" clause was to be scratched off whenever the individual road deemed it proper to do so. Of course it would have to do this whenever the interest of a good shipper demanded it, and that of course insured the concession to all shippers needing it. Evidently if the railroads had put this matter into the hands of their best diplomats the public agitation would not have occurred at all. The 20 per cent. addition was, of course, unreasonable from the beginning. The demand is not a new one; it has existed, on paper, for years, but everybody knew it was absurd. Probably two or three per cent. would more than cover the real risks of loss; the other 18 or 17 per cent. is penalty. Such a penalty is all right in theory; but besides being excessive in amount it was doomed to failure by the inconsistencies surrounding it. How can a railroad impose penalties when shippers everywhere look upon the railroads themselves as law-breakers? The imposition of penalties is a function of sovereignty; and the railroad officer who thinks that the public will tolerate anything original in that line from him is about 30 years behind the times. Then, again, this penalty business would be a move in the direction of stiffness and more business-like methods; but most of the large shippers of the country are accustomed to expect from railroad traffic men something of an opposite nature; evasion of salutary rules, and tricks to get business by giving something to the shipper instead of taking something from him. The situation in this matter appears to be somewhat parallel to that sometimes seen in the passenger department, where a railroad preaches regularity four days in the week through its agents' announcements and its press agents' interviews, and the other three days makes private concessions or works tricks by means of the scalpers' offices.

The complaint which Detroit, Cleveland and other cities that are about half way between the 75th and the 90th meridians make against standard time is just; indeed, it is more than just, if we may use such a paradoxical term; for not only is Central Time too slow for them; the people are too fast even for their own cherished local time, and ought to have the Eastern standard. This is the burden of an argument presented by Mr. E. C. Hargrave which we print in another column. Assuming that the normal working day is from 7 a.m. to 6 p.m. and that the desideratum is to so set our clocks that we shall secure, in the autumn, when everybody is busiest, the largest amount of daylight be-

tween those hours, he quickly shows that Detroit time is too slow for Detroit, and that the people of that city had better adopt Utica time (75th meridian or Eastern standard). On the same basis we in New York had better adopt Kennebunkport time; but perhaps to mention this at this time would be lugging in a side issue; so we will let it pass. Not having so warm a sympathy as we ought toward our brothers who live in Detroit, we had always thought that their proper course, if they didn't like to go to work at 7 o'clock by St. Louis time, was to go to work at 6:30 by St. Louis time. Living here in snug comfort, only four minutes from the 75th meridian, which is very close to the city that now rules the world (i.e., rules the greatest "world-power"), we had never thought that getting up at 6 o'clock became a hardship simply because the clock showed 5:30. But it appears that every suggestion to use the Central Standard in Detroit factories is met by the opposition of the labor unions—and no labor union is ever mistaken as to what it wants. The final and insurmountable difficulty with Central Time in Detroit is that the churches and theatres are determined to begin their evening services and entertainments at 8 o'clock, so that the poor shop man who ends his day's work at 5:30 has a half hour more time than he needs for putting on his evening suit. He loses a half hour at home in the morning, when he needs the time, and makes it up in the evening when he does not need it. The chief trouble, however, with Mr. Hargrave's plan, is that Chicago will not accept it. Could that proud city, after 21 years of normal and easy time-reckoning, think for a moment of having two clocks, an hour apart, in each of its great railroad stations (except the North Western)? Never!

The general manager of the Chicago & North Western has issued a circular to superintendents and yardmasters which reads as follows:

"See that a minimum time is absolutely afforded train and engine crews for rest as follows:

"Men ten hours or less on duty, eight hours' rest, minimum.

"Men twelve hours on duty, ten hours' rest, minimum.

"Men fourteen hours on duty or more, twelve hours' rest, minimum.

"Keep before the train dispatcher such record of movement of crews as absolutely will prevent an engineman or trainman from going out on a run without the full allotted time for rest.

"Check this matter up personally to see that the rule is being carried out, examining reports periodically as to rest actually allowed."

In order that a check may be maintained, the proper officials at terminals are being provided with what is known as a "rest book," in which records of every crew will be kept. The reporter who publishes this circular says that all of the Chicago superintendents are considering the subject and all are of opinion that rest must be assured "except in emergencies." But why this exception? Is not an emergency just the time when some man's judgment will fail? Occasions will arise when a conductor or an engineman will be unable to take his train to destination in less than, say, 20 hours; but should not such cases be subject to the rule, without exception? If the rule makes the work-time limit 15 hours, why not require the train to be sidetracked (or, if stalled, to be deprived of its main track rights) on the expiration of that time, unless the superintendent specifically suspends the rule in each case? The trainmaster and despatcher are under constant temptation to stretch the meaning of the term "emergency," and it would be salutary to require them to get their judgment confirmed, every time, by a higher officer, before allowing a man to work excessive hours. The modification of rest-rules should be made difficult. This would tend to cultivate in the minds of all concerned a sense of the dangers that it is desired to guard against and would help the runners and conductors themselves to realize the importance of taking special pains to keep themselves awake when working longer than usual. Cultivation of an adequate sense of dangers and responsibilities is, indeed, one of the main benefits of such a circular as that which the North Western has issued; for the mere correction of hours is not in itself an infallible corrective of practice. Men sometimes sleep when they have been on duty much less than 10 hours.

Senator Elkins, Chairman of the Senate Committee on Interstate Commerce, said at Washington this week that his committee would probably propose the creation of an interstate commerce court, to be composed of nine members, including one from each judicial circuit; but he does not think that Congress is likely to pass any law affecting rates of transportation at this session. The utterances of President Roosevelt in his annual message on the subject of railroad rate regulation have been the most prominent topic of discussion in Washington during the past ten days. All are agreed that the present Congress is not likely to act. Some of the observers say that this is due to the settled opposition of the members of the commerce committees in both houses, who have prevented action each year for several years past; while others think that a majority of both houses of Congress is now convinced that action must be taken in order to meet the pressing demands of the West, but that the technical difficulties of the subject, when it comes to the drafting of a bill, will make it impossible to reach an agreement before March 4. When, at a committee meeting last week, it was proposed to order a series of hearings on the question, Mr. E. P. Bacon, the chief advocate of a law to give rate making powers to the Interstate Commerce Commission, said that hearings were not necessary; everybody knows the facts; the thing now is to act. In this Mr. Bacon is substantially correct. Congressman Steenerson, of Minnesota, has introduced a bill to give the Interstate Commerce Commission rate-making powers. It appears to contain nothing new or different from what is already embodied in the bills presented a year ago by Senator Quarles and Representative Cooper. Some of the gossips say that the President will send to Congress another message on this subject. It was announced in Washington this week that Mr. Paul Morton Secretary of the Navy, would continue in the cabinet beyond the President's present term. It does not appear whether Mr. Morton is to remain at the head of the Navy Department or is to take one of the other portfolios; but it is said that the President desires to keep him as an adviser on the question of railroad rate legislation, on which Mr. Morton is said to believe that action is necessary. Comment on government control of rate-making will be found in another article in this issue.

NEW PUBLICATIONS.

The Roadmasters' Assistant. New and Revised Edition. New York: 1904. THE RAILROAD GAZETTE. Cloth, 290 pages. Price, $1.50.

Within the last five or six years the art of railroad track building and maintenance has made rapid strides forward, and the 1898 edition of The Roadmasters' Assistant having become out-of-date, a new and revised edition of this useful little guide and reference book was made necessary. No attempt has been made to change the arrangement or scope of the subject-matter in the present edition, but the text has been carefully edited and the illustrations revised, and new ones substituted in many places. The most important changes have been made in the chapters on Rails and Rail Fastenings, which have been entirely rewritten. The chapter on Water Supply has been added to and enlarged to include water softening plants and gasoline pumping engines. Other books have been written on track and allied subjects which are full of theory, and opinion. The Roadmasters' Assistant has been written with a different object in view. The aim has been to make a practical book for practical men, convenient in size and arrangement and simple in language.

CONTRIBUTIONS

Suggested Changes in Standard Time.

BAY CITY, MICH., Dec. 1, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The object of this article is to discuss whether the irregular division between eastern and central time should not have been farther west, and instead of being where shown by line No. 1, on the first diagram, should be about where line No. 2 is drawn.

In 1883 the railroad companies of the United States and Canada adopted what has since been known as Standard Time. The wisdom of its adoption has ever since been fully proven by its great convenience to the traveling public, as well as to the railroad companies. All who traveled previous to that time can well remember the great confusion of times at all places, not only where eastern and western roads met, but in almost all towns and cities through which such roads ran. For many years prior to this, the subject of some uniform standard of time that could be adopted by all the people or with which the time used in the different sections of the country could be compared, had been discussed.

Of course it is universally known, and is only mentioned here to get the subject clearly before us, that as we travel from any point westward time gets slower as compared with the starting point. Again, traveling in an easterly direction time is faster. The rate at which time changes is one hour for each 15 deg. of longitude. It makes a difference of about one hour between New York and Chicago, and three hours between New York and San Francisco. Because of the great difference between the eastern and western sections of our country, it would be practically impossible to use the same time; that is, to have the clocks in all parts of the country set at the same hour, because there would be too great a difference between part of the clocks and solar time. Before the adoption of standard time, in most cities the time due to their location on a certain meridian was in use, and in others, the time of a nearby observatory. This time was designated local time. The great difficulty and inconvenience of using local time grew out of the great magnitude and importance of the railroads. The managers of the different railroads selected for their use the time of the most important or the most central city on their line. Sometimes there was one standard for one part of the line, another for another part. It was almost im-

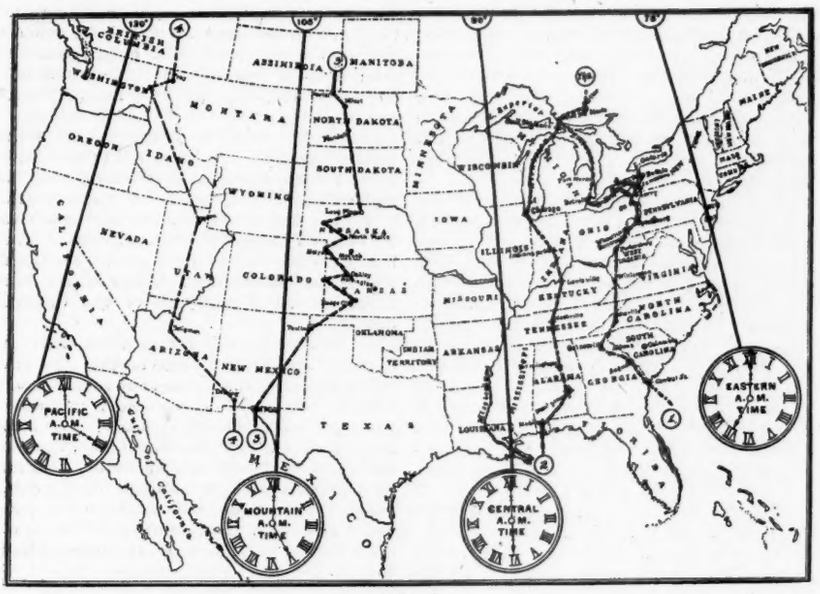


Fig. 1.

possible to keep track of the times of the railroads and connecting roads at junction points. There were about 75 different times in use on the railroads of the United States.

Before 1883 the railroads were in many localities running on a time of their own arbitrarily adopted, while the residents used local time; also, in many cities where local time was used by the inhabitants, different roads running into the same place would be using different times. Detroit, New Haven, and a number of other cities, had three times in general use by the citizens and railroads. In making a trip from Boston to Washington the time by which the railroads operated changed five times. Almost endless was the confusion of the traveler, and not much less that of the railroads. In 1883 all this was changed; a standard of time was adopted by the railroad companies; and now, while in the nature of things, changes of time must occur, each change is a difference of exactly one hour. The subject was discussed for years and finally the details of a plan were worked out by Mr. W. F. Allen, Secretary of the General and Southern Railway Time Conventions, held in New York and Chicago in April of 1883, where the following resolutions were adopted:

1. That all roads now using Boston, New York, Philadelphia, Baltimore, Toronto, Hamilton or Washington time as standard, based upon meridians east of these points, or adjacent thereto, shall be governed by the 75th meridian or eastern time (four minutes slower than New York time).

2. That all roads now using Columbus, Savannah, Indianapolis, Atlanta, Erie, Louisville, Chicago, Jefferson City, St. Paul or Kansas City time, or standards based upon meridians adjacent thereto, shall be run by 90th meridian time, to be called Central Time, one hour slower than Eastern time, and nine minutes slower than Chicago time.

3. That west of the above named section the roads shall be run by the 105th and 120th meridian times, respectively, two and three hours slower than Eastern time.

4. That all changes from one hour standard to another shall be made at the termini of roads or at the ends of divisions.

Standard time as agreed upon was adopted by most of the New England railroads October 7, and by nearly all the other railroads east of the Rocky Mountains Nov. 18, 1883. Most of the towns and cities soon followed the example of the railroads, but although Standard time has been largely adopted for general use, it must be clearly borne in mind that it was invented and adopted by the railroad companies solely for their convenience, without once consulting any community as to whether they would use it or not. How the clock time agreed with solar time or hours of daylight, or the convenience of the people along their lines, had nothing to do with its adoption. To quote from one of its principal advocates: "The people will have to travel by Standard time whether they eat and sleep by it or not."

The country was divided into four irregular sections. Commencing from the east, the first section takes the time of the 75th meridian, which is known as Eastern time; the second section, the time of the 90th meridian, known as Central time; the third section of the 105th, known as Mountain time; and the fourth of the 120th, known as Pacific time. The limits of these sections are not regular, because the railroads had to select certain places or cities as points at which it would suit their convenience for their lines to change from one time to another. These time change points in most cases were the railroad terminals, although a very few of them were simply important division points. This will best be understood by looking at the accompanying map (Fig. 1), a glance at which will show the different points where the changes in time are made.

It will be seen that four heavy lines, running north and south, mark the location of the 75th, 90th, 105th and 120th meridians, the ones from which the different sections take their time. Four other very irregular lines are shown, each line being numbered. These lines, except number two, mark as nearly as can be marked the division between the sections. No definite division can be made, because sometimes railroad lines will run close together, nearly parallel, and the places where they change may be many miles east or west of each other. To illustrate: The Lake Shore & Michigan Southern and Michigan Central Railways change from Eastern to Central time at Buffalo; the Grand Trunk changes at Detroit, 230 miles further west; one railroad changes at Columbia, S. C.; others at Gainesville, Ga. Note that line No. 3, which marks the western boundary of the section that takes its time from the 90th meridian, near the southern end, passes to the west of the 105th meridian, the time of which meridian is the standard for mountain time.

Between Eastern and Central time changes are made at Sault Ste. Marie, Cartier, Sarnia and Windsor, Ont.; Buffalo, Dunkirk, and Salamanca, N. Y.; Butler, Corry, Erie, Franklin, Newcastle, Oil City, Pittsburg, Titusville, Union City and Washington, Pa.; Benwood, Kenova, Parkersburg, Wheeling and Williamson, W. Va.; Asheville, N. C.; Columbia, S. C.; Athens, Augusta, Central Junction and Gainesville, Ga. The changes between Central and Mountain time are made at Mandan, Minot and Portal, N. Dak.; Alliance, Long Pine, McCook and North Platte, Neb.; Cheyenne Wells and Holyoke, Colo.; Dodge City, Hoisington and Oakley, Kan.; Texline and El Paso, Tex. Between Mountain and Pacific sections at Spokane, Wash.; Troy, Mont.; Huntington, Ore.; Ogden, Utah; Seligman, Ariz., and Deming, N. Mex. It is readily understood that in the part of any section lying east of the meridian from which it takes its time, the Standard time adopted is slower than the local time formerly used, and in the part lying west of the meridian Standard time is faster than local time. To illustrate: The following cities lie east of

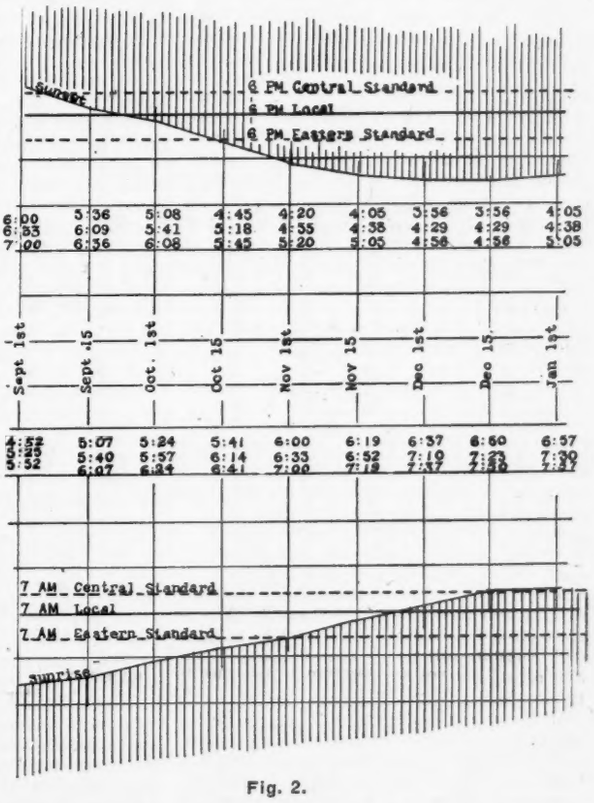


Fig. 2.

the 75th meridian, the time of which is used for Eastern standard. The numbers set opposite each city show the number of minutes Standard time is slower than local: Portland, 18 minutes; Boston, 16; New Haven, 9; Albany, 5; New York, 4.

The following large cities lie west of the meridian, so that Standard time is faster, as follows: Syracuse, 5 minutes; Rochester, 10; Buffalo, 15; Erie, 22; Pittsburg, 20; Wheeling, 23; Washington, 9; Richmond, 10; Columbia, 24; Windsor, Ont., 30.

In the following cities lying in the eastern part of the section using Central time, Standard time is slower than local time, as follows: Cleveland, 34 minutes, Columbus, 28; Detroit, 28; Dayton, 23; Cincinnati, 21; Indianapolis, 15; Chicago, 10.

Local time is often spoken of as "God's time," while Standard time is called "man's time." As a matter of fact, "God's time," or true local time, is never used because it is too irregular, which irregularity is caused by the variation of the earth in its orbit and its inclination from or toward the sun. This variation from the time known as local time amounts to over one-half hour during the course of a year, as will be seen below. The time set opposite the day of the month is the local time when the sun is directly over the meridian; 12 o'clock:

Jan. 1	12:03:24	July 1	12:03:26
Jan. 15	12:09:21	July 15	12:05:38
Feb. 1	12:13:41	August 1	12:06:11
Feb. 15	12:14:21	August 15	12:04:29
March 1	12:12:40	Sept. 1	12:00:10
March 15	12:09:17	Sept. 15	11:55:27
April 1	12:04:11	Oct. 1	11:49:56
April 15	12:00:14	Oct. 15	11:46:00
May 1	11:57:07	Nov. 1	11:43:42
May 15	11:56:11	Nov. 15	11:44:34
June 1	11:57:29	Dec. 1	11:48:52
June 15	12:00:02	Dec. 15	11:54:54

It will be seen that a large variation from actual sun time was averaged up by man, when what is known as local time was adopted. Our method of keeping time was designed and adopted for man's convenience. This was better understood, and the direct object when Standard time was adopted. Yet with this in view, at many points, Standard time makes worse a defect that has always existed in local time, that is, the center of the period of light does not come at the middle of the working day. It does not make much difference in the summer time, when there is always more light than is used, but in the months when daylight is the shortest, and especially in the fall, when there is much work to do, it is serious.

This causes the most inconvenience where there is much work to do, and it is difficult or undesirable to have artificial light. This includes a great deal of labor. To illustrate: October 1st the sun rises at 5.57 and sets at 5.41. As most work commences at 7 a.m. and stops at 6 p.m., it is seen that the sun rises 1 hour 4 minutes before time to commence work and sets four minutes before time to stop work. October 15th the sun rises at 6.14 and sets at 5.18. November 1st it rises at 6.33 and sets at 4.58. November 15th it rises at 6.52 and sets at 4.38; that is, it rises eight minutes before time to commence work and sets 1 hour and 22 minutes before time to stop work.

It has been the practice in many places where large numbers of men are employed to set the clocks one-half hour faster than the local time, when the days begin to shorten. In mining regions and in communities largely dominated by one or a few large manufacturing plants, it is at the present time the custom to change the clocks and blow the morning, noon and night whistles without regard to either standard or local time, and simply make the noon hour the middle daylight point, to the end of getting all of the fall and winter daylight within the working hours. The writer visited a town north of Detroit containing a number of lumber, manufacturing and finishing works belonging to one company. The works and all the people were using Eastern Standard time, while the railroads were using Central Standard time. It gave great satisfaction but would have been much better had the railroads used the same time.

When Standard time was adopted in the cities lying east of the meridian from which their time is reckoned, the length of the period of daylight before the time to commence work, and the period of darkness before time to stop work, were greatly increased. To illustrate: Take the case of Cleveland, which uses Central time. October 1st the sun rises by Standard time at 5.24 and sets at 5.12; it rises 1 hour and 37 minutes before time to go to work and sets 49 minutes before time to stop. October 15th the sun rises at 5.41 and sets at 4.45. November 1st it rises at 6 and sets at 4.20. November 15th it rises at 6.19 and sets at 4.05. It is readily seen how great an inconvenience this causes. As a result, in cities situated as are Cleveland, Columbus, Toledo and others about on the same meridian, all the enterprises that employ labor either run by local time, or—which is the same thing—commence one-half hour earlier by the clock, keeping Standard time. Some cities, like Detroit, refuse to adopt Standard time, and the reason for not adopting it is always because of the protest of the laboring classes.

The Mayor of Detroit writes: "Many efforts have been made by various interests to have the city government adopt the Central Standard time, but on each occasion there has been such a protest from labor organizations, some of our merchants and others, that the plan has been overwhelmingly defeated."

The argument is often advanced, if the clock is set back, soon everything adjusts itself to the new order, and no one knows the difference. One of the main things, the sun, refuses to be adjusted by it, and factories and other industries will run approximately to the time that gives the most light during the period of work. Again, the argument is advanced, suppose work starts at 6.30 instead of 7 and stops at 5.30 instead of 6, is that not practically the same for the men? Granted, as far as that goes, and it would be the same if the trades people and professional men would do their work one-half hour earlier, and if the churches, theatres and evening meetings would also start by time one-half hour sooner; but they do not and will not, and the only reason that can be given is that they have been accustomed to certain hours and will not change. As a result, the men who do most of the work go to and from work by a time one-half hour earlier than in general use. After leaving their place of employment, every other place goes by the slower time, resulting in the loss of one-half hour's time in the evening, which half hour has to be made up by getting up one-half hour earlier to go to work by the faster time. There is no doubt but this is a considerable hardship and that their objections are well taken.

In some cities the schools either run on local time or have their sessions commenced earlier by Standard time. This brings the noon hour at 11.30 instead of 12, which again, in all families, except of the working people referred to above, deranges the noon day meal. In the schools which run on Standard time and usual hours the noon day meal comes at the wrong time for those using the faster time, and it is also difficult to get sufficient light for the pupils to study by late in the afternoon of the short days. In many places where artificial light cannot be had during short days, darkness comes on before the time for the men to stop work, causing loss to the employees and employers; loss also, because less work can be performed, and probably what is done is of inferior quality.

The writer wrote to nearly all the cities located about on the same meridian as Detroit, Toledo, Cincinnati, etc., and from the answers received it was found that practically all the factories run on either local time or one-half hour faster of Standard time; that the time as now used causes confusion, and is not satisfactory. These letters were addressed to the mayors of the different cities.

As a remedy for the troubles here recounted the writer suggests that the railroads move the division between Eastern and Central time farther west, and instead of having it where described above, it be made about on the line of Lake Michigan, Chicago, Indianapolis, Louisville, Nashville, Birmingham, Montgomery and Mobile. That would make Standard time the number of minutes faster than local time indicated by the figure set opposite the names of the cities given:

Detroit	32	Columbus	32
Toledo	34	Cincinnati	39
Cleveland	26	Dayton	37

Taking Cleveland as an example we will see how the new, or Eastern (instead of Central) time will fit the conditions of light and suit all the people. Attention is called to Fig. 2. The distance between the horizontal lines, except those drawn to show 7 o'clock a.m. and 6 o'clock p.m., Eastern and Central Standard time, represents a period of one hour. The perpendicular lines represent the first and fifteenth of each month from September 1 to January 1. The lower shaded portion shows the period before sunrise and the upper shaded portion after sunset.

The groups of three figures at A and B above and below the line of dates give the different times at which the sun rises and sets at the dates given. The central figures in each group show the time by local time, the upper, Central Standard, and the lower, Eastern Standard time. Lines are drawn and marked 7 a.m. and 6 p.m., local Eastern Standard and Central Standard, to show the relation between the time to commence work and sunrise, and the time to stop work and sunset by the times under discussion. By following the times denoting 7 a.m. and 6 p.m. Central time, will be readily seen that the large section of daylight before the time to commence work, together with the large period of darkness before it is time to quit work, making this time absolutely impracticable for most kinds of work.

Following the lines marked 7 a.m. and 6 p.m. local, it will be seen that by local time the proper division of daylight to suit the working day is much improved, as compared with Central Standard. Again, when we follow the lines marked 7 a.m. and 6 p.m. Eastern Standard, we find still further improvement, and although by using this time the period of light is not evenly divided to suit the start and finish of the working day, it is approximately so, being a great improvement over the other times.

It has been shown that the fall and winter is when the light should be most evenly divided between the time of starting work in the morning and stopping in the evening. Using the same dates as before—October 1st, by Eastern time, the sun would rise at 6.24 and set at 6.08; October 15th it would rise at 6.41 and set at 5.45; November 1st it would rise at 7 and set at 5.20; November 15th it would rise at 7.19 and set at 5.05. It will therefore be seen that by using Eastern time in the cities mentioned and others in the same territory, the time used would not be

quite fast enough to exactly divide the daylight between the morning and evening. It would not only make it possible to use Standard time wherever labor is employed, but it would also be a great improvement even upon the local times formerly used.

As all the time used is artificial and made for the convenience of the people, while we are making it why not make it as convenient as possible? In the letters mentioned before written to the mayors of a large number of cities and towns in the territory of which we write, the question was asked: "Would it not be better for all your people and especially those who do ordinary labor if Standard time was one hour faster?" The great majority answered: "Yes," and a few "I do not know; never thought of it." Only two said they thought as there had been so much trouble getting Standard time started, better leave it alone.

The following would be some of the advantages of the change. The railroads would have a much longer run without change of time. Some of the large lines, as the Michigan Central, Grand Trunk, Lake Shore and Michigan Southern, Nickel Plate, Big Four and many others, would operate their entire lines under one time, therefore causing less confusion to the railroads and traveling public. It would favor the people who work, scholars in schools, and all who need more light the latter part of the day during the short days. As the change would do no harm to the merchants and those whose work is connected with the professions there is no reason why they should not adopt the new time, then all the people would use the new time and the present confusion cease to exist.

The new time would also be a great advantage during very hot weather. The hottest part of the day is the middle of the afternoon, and by moving the time one hour faster a much larger part of the work would be performed before the time of the greatest heat, leaving a shorter time to work after the time of the greatest depression. The writer has talked with many and looked carefully for one reason why the plan should not be adopted and can find none.

E. C. HARGRAVE.

The Cole Four-Cylinder Balanced Compound.

Dec. 3, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am glad of the opportunity to read over Mr. Moore's criticism (see *Railroad Gazette*, Dec. 2, 1904,) of the counterbalance of our four-cylinder compound and to expose the fallacy of his reasoning, and his ignoring of certain elementary principles in mechanics. It may be interesting to call attention, before proceeding with the argument, to the fact that it is well within the mark to state that at least 90 per cent. of all the four-cylinder balanced compound engines which have been built in different parts of the world have the power sub-divided, the high-pressure cylinders driving one axle and the low-pressure cylinders the other. In France, where this type of engine has been successfully used for many years, this arrangement is used practically to the exclusion of all others; and Mr. De Glehn, who, more than any other man, deserves credit for the development and introduction of this type of engine, recommends and uses this arrangement to the exclusion of practically all others. The French roads have at the present time over 1,000 engines of this kind in service.

The statement for the New York Central balanced locomotive No. 3,000 that "four cylinders are so arranged in relation to each other that the horizontal moving or reciprocating parts balance each other without the use of the customary counterweights for these parts in the driving wheels," is practically correct, and the error into which Mr. Moore has fallen in his hasty criticism is, in regarding the reciprocating parts themselves as producing the vertical force or "hammer blow" upon the rails at every revolution, which is a popular misconception, believed in to a certain extent by some persons.

As far as the track alone is concerned, there would be no vertical action or hammer blow if the over-balance for the reciprocating parts in an ordinary engine were omitted, but it is customary to add a certain proportion of these weights in the wheels directly opposite the crank pin, in order to neutralize, as much as possible, the action of the reciprocating parts on the engine itself in order to make it run smoothly, and to save the engine frames and moving parts from unnecessary vibration and shocks. In a balanced engine, the reciprocating parts on the inside of the frames balances those on the outside which move in the opposite direction, so that the use of the customary amounts of counterweights for reciprocating parts in the wheels is rendered unnecessary. It is also well known that an engine of this description runs smoothly without the use of weights for balancing reciprocating parts. This can be shown conclusively by mathematical proof, and it is a matter of common knowledge that these engines run remarkably steady, both on the road and testing plant.

The action of the reciprocating parts is entirely horizontal and no vertical force can be exerted by these parts except the slight vertical component produced by the angularity of the main rods; hence there can be no pressure produced upon the rail by the action of the reciprocating parts. Mr. Moore is evidently confusing the "hammer blow" in simple engines produced by the overbalance in the wheels to take care of the reciprocating weights, with the action of the reciprocating parts themselves which have nothing to do directly with the hammer blow. So far as the principle of balancing is concerned, it makes no difference whether the main rods are connected to a single or separate axles. In either case, the reciprocating weights counteract each other and counterbalance for all the rotating weights is all that is necessary.

Had Mr. Moore witnessed the test of the New York Central No. 3,000 at the World's Fair when running at 75 miles per hour, he would no doubt have been satisfied that the counterbalance of this engine left little or nothing to be desired. The absence of vertical motion was demonstrated by means of wires run under the wheels. These wires were flattened along the entire length.

F. J. COLE.

KANSAS CITY, MO., Dec. 10, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of December 2 there appears a communication from L. E. Moore regarding the counterbalancing of the Cole four-cylinder balanced compound No. 3,000 built for the New York Central by the American Locomotive Company. He says the claim is made in print that "the four cylinders are so arranged in relation to each other that the horizontal moving or reciprocating parts balance each other without the use of the customary counterweights for these parts in the driving wheels." After describing the way in which the engine is coupled up he says: "The customary counterweights are omitted in the wheels except enough to balance the side rods and a part of the mass of the cranks in the cranked axle." He then proceeds to show that such an engine would be anything but a balanced engine.

The writer has met master mechanics who did not understand the rudiments of dynamics, but it seems almost incredible that the designer of this engine could be ignorant or unmindful of the vertical forces acting on the main pins, cranks and cross heads due to the motion of the main rods. In the common types of engines we can balance in one direction, either horizontally or vertically, but not in both directions. In practice we have, therefore, a compromise in which we have over-balance in one direction and under-balance in the other.

The magnitude of the hammer blow of modern heavy engines when running at high speeds due to this defective balance and its destructive action on track and bridges is what has led to the building of a limited number of so-called balanced engines. The object sought in designing the balanced engine has been to practically balance all of the moving parts in both directions in order to reduce the hammer blow and to increase the driving axle loads without increasing the destructive action of the locomotive on track and bridges.

Is it not possible that Mr. Moore has been misinformed regarding the counterbalancing of the Cole engine? There is no difficulty in counterbalancing such an engine just as closely as an engine in which all of the cranks are connected on one axle. The vertical forces generated in the main rods are transmitted to the main pins or crank and to the cross heads in the proportion of about 7 to 1, depending on the design of the rods. What goes to the pins and cranks can be balanced by weights in the wheel centers. The horizontal forces of the counterweights being in opposite directions will balance each other. Owing to the transverse horizontal distance between the wheel centers and the inside rods, it might be well to divide the counterweights between the two wheels in the inverse ratio of their distances from the rods attached to them. The forces going to the cross heads are practically equal and opposite in direction, but, owing to the horizontal distance between their points of application, they produce an alternating couple which tends to rock the whole body of the engine. Since, however, we neglect the much larger similar couple caused by the working thrust on the main rods it is hardly necessary to consider them.

Without a diagram of the engine to consult, it would appear that the largest unbalanced forces in the Cole engine are due to the perpendicular distance between the centers of the piston rods on each side. If the writer remembers correctly, the inside cylinders are higher than the outside cylinders; therefore, we will have two alternating couples acting on the oblique planes passing through the centers of the piston rods. These would, of course, tend to give the engine the same "duck motion" which is found in under-balanced engines of the common type. The magnitude of these couples is easily computed, but, no doubt, it is but a small fraction of the somewhat similar couples set up in most simple engines.

ELLIOT HOLBROOK.

Rail-Carrying Joints.

Paris, Nov. 25, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In connection with my previous communications published in your issue of November 13, 1903, and January 29 of this year, I beg to call attention to Mr. Haarmann's latest publication containing his lecture before the

"Verein für Eisenbahnkunde" May 10, 1904.

In your issue of November 6, 1903, you illustrated Mr. Haarmann's superstructure, tested on the Berlin high-speed test track. The wheel-carrying angle bar used there was unfavorably reported on by the "Central Organ der Bauverwaltung" November 11, 1903, and by the "Organ für die Fortschritte des Eisenbahnwesens," April, 1904. I will here only speak of a few points which may be of interest to American engineers.

Mr. Haarmann reports that the Prussian Minister of Railroads has recently ordered a further test to be made with his superstructure. This is rather surprising, coming so soon after the official condemnation of *all wheel-carrying joints*, and leads one to believe that the Minister has grown somewhat suspicious as to the correctness of his referee's theory. The Prussian Government railroads have been testing the different kinds of "Blattstoss" (lapped rails) on a large scale, but up to date they do not seem to have been able to arrive at any satisfactory conclusion, as otherwise they would not continue to equip all their main lines with the ordinary rail and angle bar.

The main objection to the "Blattstoss" was the increased weakness of the rail ends. Mr. Haarmann tried to overcome this by supporting the ends with his joint carrier. The results obviously were no more satisfactory than those which have been attained by supporting the foot of rail ends with bridges. As a last resource Mr. Haarmann took recourse to the wheel-carrying angle bar, and discovered that his joints with bridges and carrying bars, after a severe winter, were behaving better than all the others. He refers in his lecture to the remarkably good results which have been achieved in Saxony and Bavaria by equipping ordinary rails with wheel-carrying angle bars. These results are not new; they have been well-known for many years, such a device now being used on about 2,000 miles of track.

The most interesting point in his statement is that his joint carrier relieves the strain on the bearing surface of the angle-bars; in other words, that the angle-bars intended to support the rail ends necessitate being themselves supported. It is scarcely possible to explain more clearly the mistake which has been made for so many years by supporting the angle-bar on the rail ends, instead of relieving the weak ends of at least a part of the pressure. This can only be done by supporting the carrying joint immediately on the joint ties. Experience with my rolled joint has shown that by these means even old tracks with battered ends can be kept in shape for a great number of years, at the same time securing smooth riding and considerable reduction in cost of maintenance of way. There is therefore no reason whatever why the existing system of rails should be replaced by a more expensive one.

Those who claim the increased expense for replacing outer angle-bars by the Barschall joint to be a disadvantage do not consider that the saving in cost of maintenance of way, and still more, the saving of interest for so many years on investment for new rails, gives an immense return. With the present prices of rails there is good reason to employ the means at hand in order to prolong the life of rails. By using say 1,000 tons of rolled joints, about 10,000 tons of rails can be saved until they are worn out in their entire length. A "retrenchment" of this kind has more sense than all others.

Mr. Haarmann also said that he is making tests for the purpose of improving the efficiency of the wheel-carrying principle by changing the shape of the tread of the main rails; in September last, this change was made public as consisting in a flattening of the outer head. From the description of the "double rail joint" printed elsewhere in this issue it will be seen that in this direction Mr. Haarmann's ideas have been anticipated!

MAX BARSCHALL.

Pernicious Diversity in Signal Practice.

THE LAKE SHORE & MICHIGAN SOUTHERN RAILWAY COMPANY.
CLEVELAND, OHIO, Nov. 21, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I note that there is being put on the market a form of semaphore signal operated directly from a switch stand and located at the point of facing point switches. This semaphore in its form as well as in the position and light displaying indications is identical with the semaphore used at interlocking plants. It is so arranged that when the switch is set for main track the arm is lowered and the white light shown; when switch is set for siding the arm assumes a horizontal position and a red light is shown.

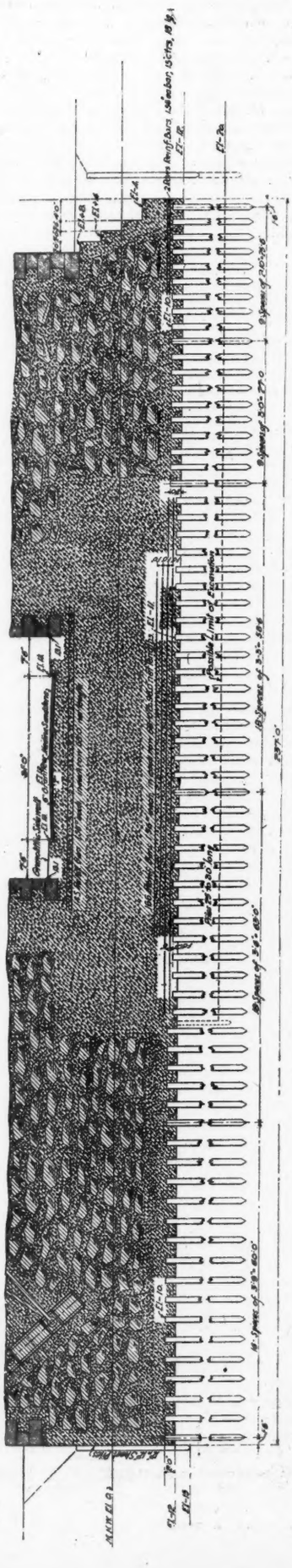
I think this device used in this way is wholly improper, in fact, pernicious, and that all who are interested in proper signaling should unite in protest against its being used in the manner in which it is intended to use it. In signaling by means of semaphores the rules in this country are well nigh universal. With arm in horizontal position, and (in addition) by night a red light indicates stop. The arm lowered, either 60, 75 or 90 deg., and, in addition, a proper light at night (on some roads green, on others white) indicates proceed.

Every semaphore signal should indicate one of three things, viz., stop, caution or proceed. Now in this device the semaphore is deliberately used to indicate, when in a horizontal position, that the switch is set one way, and when it is in an inclined position that the switch is set another way. I do not think there is anything that should be more vigorously objected to than the use of the stop indication of the semaphore signal as a means of conveying information regarding the position of a facing point switch. If such a switch-stand is to be used it should either be provided with two arms, so that a proceed signal can be given for either route, or there should be some additional indication to denote the position in which the switch is set.

AZEL AMES, JR.,
SIGNAL ENGINEER.

Anchorages for the Manhattan Bridge.

The Department of Bridges, City of New York, has issued contract plans and specifications for the anchorages of the Manhattan Bridge, No. 3, over the East river about half a mile above the Brooklyn, and will shortly advertise for bids on the work. It will be remembered that under the former bridge commissioner plans for this bridge were prepared which contemplated the use of nickel-steel eye-bar chains with stiffening trusses and rocking steel towers. These plans were published in the *Railroad Gazette*, Dec. 4, 1903. The present commissioner, Mr. Best, on taking office last January discarded the proposed eye-bar chain cables and had the original plans for a steel wire cable bridge with fixed steel towers revised and completed. Last July these completed plans were submitted to the Municipal Art Commission for its approval, according to law, and were the subject of further controversy. Reproductions of the architect's sketches showing the completed bridge were published in the *Railroad Gazette*, July 1, of this year. The tower piers for this bridge are completed and the work on the anchorages now remains to be done before the superstructure can be started. When completed the

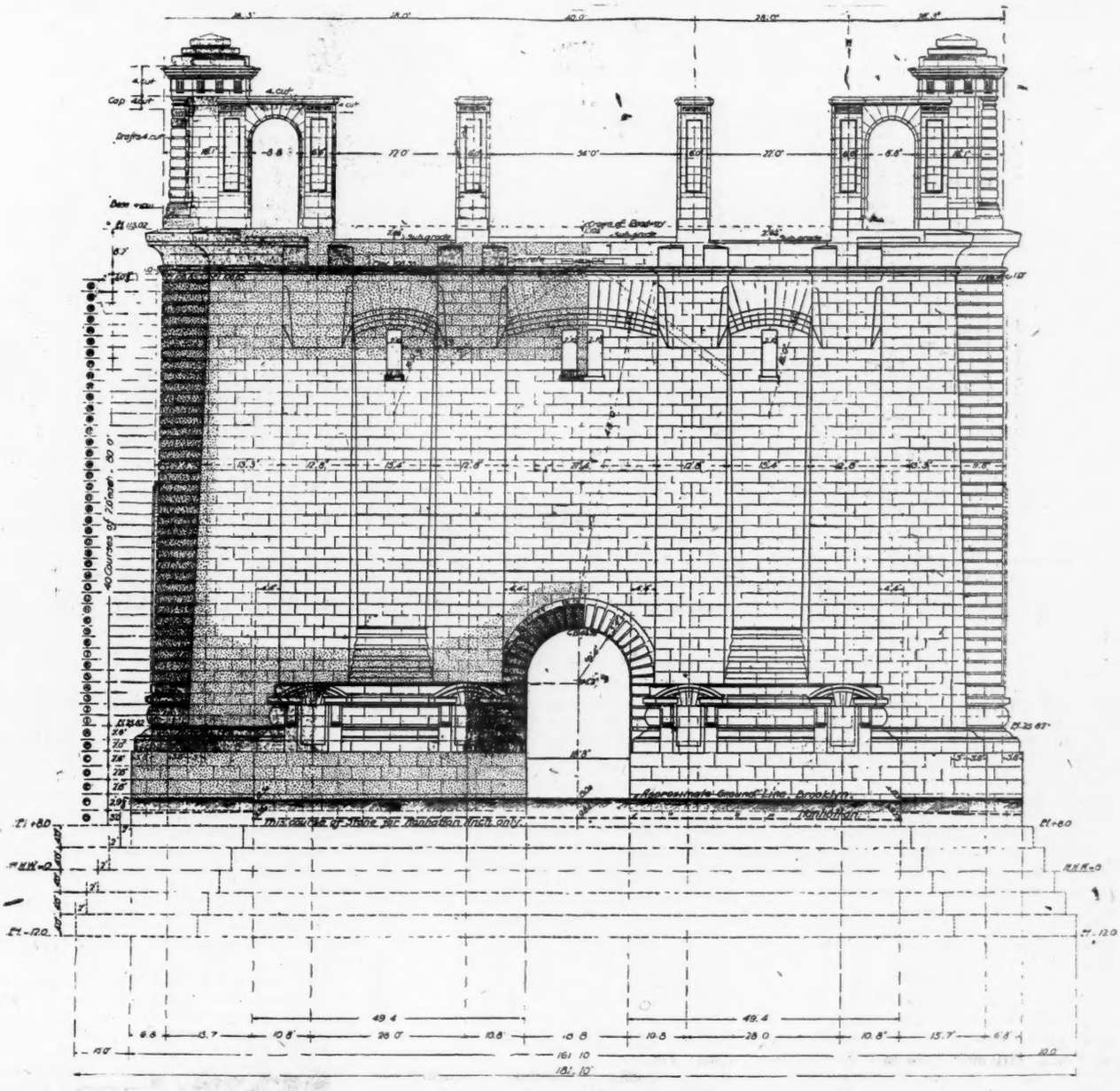


Longitudinal Section Through Foundation of Anchorage.

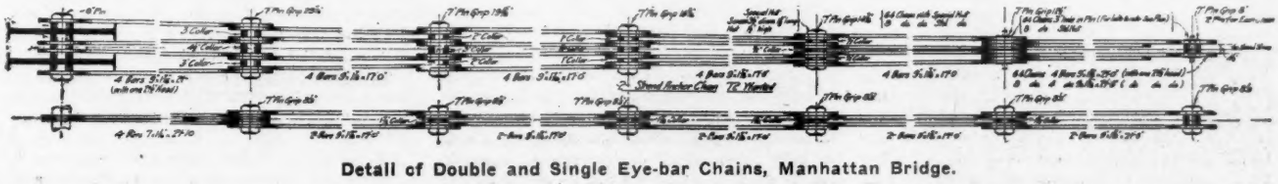
bridge will have a clear channel span of 1,470 ft., with two identical shore spans 725 ft. long.

The anchorages on both sides of the river will be identical and the foundations will cover an area 237 ft. x 181 ft. The Manhattan anchorage will stand at the intersection of Cherry street and Pike Slip, and the Brooklyn anchorage at the intersection of Adams and Water streets. On the New York side it is expected that piles will have to be driven on which to support the foundation, and the plans show the proposed depth and spacing to which they will be driven. They will be not less than 14 in. in diameter at the butt and from 25 ft. to 80 ft. long, spaced about 3 ft. center to center in each direction over the entire area of the foundation. The heads are to be cut off 2 ft. above the bottom of the excavation and bedded in the concrete. Provision is also made for reinforcing bars laid in rows longitudinally along the bottom of the foundation in the center and along the heel of the anchorage. The solid body of concrete will be about 6 ft. thick over the tops of the piles. On the Brooklyn side it is not expected that piles will be necessary. The excavation will be carried on inside of an open sheet piling coffer dam made of 12-in. x 12-in. timbers tongued and grooved and driven 15 ft. below mean high water level.

Above the street level the exterior of the anchorages will be faced with cut granite masonry laid in courses 3 ft. thick. Aside from the ornamentation of the ring over the arched roadway under the middle of the anchorage and the flanking pilasters, there is no ornamentation of any kind below the level of the bridge roadway. The court or colonnade formed over the anchorages at the roadway has been treated with quite a little



Front Elevation of Anchorage, Manhattan Bridge.



Detail of Double and Single Eye-bar Chains, Manhattan Bridge.

elaborate cut stone work to relieve the massiveness of the whole structure. The roadway under the anchorages will be 46 ft. wide, including the two sidewalks, and the crown of the arch is 46 ft. above the pavement. The roadway on the bridge is 98 ft. above the surrounding street level.

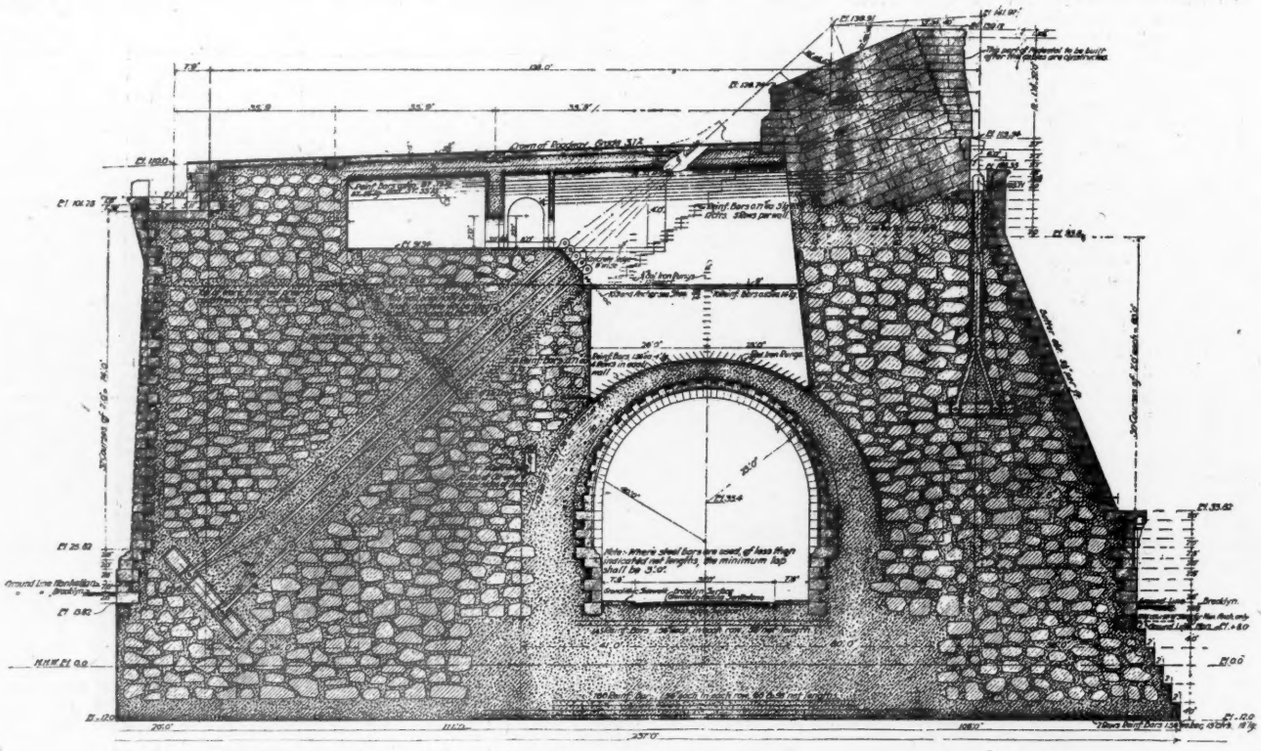
From the longitudinal section through the anchorage it will be seen that the masonry is carried up in two masses, a strut with a batter of 5⅛ in. per ft. on the outside face and a cubical mass over the heel in which the anchor bars are bedded. The space between these two masses over the arched roadway is divided into nine vaulted chambers separated by longitudinal walls, and stairways will lead down from the bridge roadway to the cable connections with the anchor chains and to the roadway below.

The main body of the backing in the anchorages will be Cyclopean masonry consisting of large stones roughly cubical in form with approximate level beds and vertical joints, bedded in, and filled around with concrete. Good quality granite, limestone or sand stone will be used, and at least 75 per cent. of the stones must have a volume of ½ cu. yd. or more. Concrete in the proportion of one cement to seven sand and from seven to 12 parts of 1½-in. broken stone will be used for filling in around the large blocks. Wherever steel work is to be bedded in concrete a mixture of one cement, six sand and from six to 12 parts of ¼-in. broken stone will be used.

The anchor chains and fastenings are divided into four groups, one for each cable. Each group consists of nine banks of three eye-bar chains each. At the upper end the eye-bars in each bank are spread out to give five points of attachment for the cables. They extend down 110 ft. in the concrete filling to the anchor girders in the heel of anchorage. Each chain consists of four 9-in. x 1 7/16-in. eye-bars. At the bottom end the middle chain is spread out and connected to the girders at the pins of the upper and lower chains. The angle of inclination is 41 deg. 55 min. 14 sec.

The anchor girders are 4 ft. deep over flanges with 9/16-in. web plates and 7-in. x 3½-in. x ¾-in. angles for flanges. They are heavily reinforced around the pin holes with two plates on each side of the web, 9/16 in. and ½ in. thick. The girders are 25 ft. long and are arranged in pairs for each bank of eye-bars. The connecting pins are 8 in. in diameter.

The bridge was designed in the office of the Bridge Commissioner, Mr. George E. Best, under the direction of Mr. O. F. Nichols, Chief Engineer.



Longitudinal Section Through Anchorage Showing Anchor Chains and Roadway Arch.

Permanent Way for Fast Train Services.

The following extract is taken from the report on this subject for all countries except America, Germany, Holland, Rumania, Russia, Denmark, Sweden, Norway and Switzerland, prepared for the International Railway Congress by Mr. Van Bogaert, Chief Engineer and Director of the Belgian State Railway, and director of the company for laying out Chinese railroads. Thirty managements supplied information, from England, Australia, Austria, Hungary, Belgium, France, British India and Italy.

These managements use two kinds of rails: Bull-headed rails are used by the English companies, by three French companies and by two companies in British India. Symmetrical double-headed rails are used only by the French Midi Railway; the other railroads on the continent of Europe, the Australian railroads, two railroads in British India and one Irish railroad use Vignoles rails.

Rail Supports.

The rails are supported on wooden transverse sleepers, and in the case of two Indian railroads on cast iron pot sleepers with iron tie bars. No railroad uses metal sleepers, and where they had been put in, as an experiment, with rails weighing 76.60 lbs. per yard (Belgian State Railway), the results were so unsatisfactory that they had to be taken out after they had been in use only a few years; they had been put in on certain lines over which more than 100 heavy trains (weight hauled, 300 to 600 tons) ran per day. The greatest objection to these sleepers was that the ballast, which consisted of broken porphyry, became crushed; they drew up the water from the subsoil into this crushed ballast and made it muddy; under the sleeper, a sort of macadam was formed which it was impossible to pack properly. These lines were abominable. Moreover cracks started from the holes provided for the fastenings. It might be possible to avoid the drawing up of the water by carefully draining the subsoil, and to prevent the cracks by drilling out the holes, but I do not see how the crushing of the ballast could be prevented. In Germany, there are heavy lines with fast traffic which have metal sleepers; they seem to give better results, but ballast of broken basalt is used, which is probably harder than ballast of broken porphyry.

In a recent paper Mr. Labordère, Engineer of Bridges and Roads, gives some interesting figures about the German lines with metal sleepers; he observes specially: "It is moreover very difficult, as far as the life of these sleepers is concerned, to take as basis any averages, as enormous differences present themselves. Thus, the metal sleepers replaced during the last few years in the Essen district, have had lives of 9, 11, 13, 15, 16, 25, 29 and 33 years respectively. The last figure but one applies to a line over which 32 trains run per day, and the first to one over which 75 heavy trains run every day; in the latter case, the life of the rails themselves did not exceed nine years. The sleepers which had a life of 13 years supported 102 trains per day."

The reporter a few days ago examined a piece of line between Mechlin (Malines) and

Antwerp, which was being taken up; it had been built, 12 years ago, of 29 ft. 6⅜ in. rails weighing 104.83 lbs. per yard supported on 12 sleepers of creosoted oak packed with a ballast of broken porphyry. The line was on the flat and 85 trains per day ran over it: 32 passenger trains (weight behind tender, 300 to 400 tons), three-quarters of which ran at a speed of 49.7 miles per hour, and 53 goods trains (weight behind tender, 500 to 700 tons), running at a speed of 24.9 miles per hour. A very few sleepers had become split and were no longer fit for use; the others had as a maximum a wear of six millimeters (¼ in.) just below the bedplate and no screwspike had worked loose in the wood. If it had not been for the wear of the bedplates, which we will refer to later on, those sleepers would have been fit for use for another ten years or so. As for the rails, they were again put in with new sleepers, and the wear of the heads, measured by the Zimmermann profilograph, varied from three to five millimeters (0.12 to 0.20 in.) as a maximum near the inner side (the web of these rails is vertical and the average wear at the middle of the crown is three millimeters [0.12 in.]). They are good for another 40 years or more as far as the wear of the head is concerned, although the steel is too soft (ultimate tensile strength 38.10 tons per sq. in.). I must say that I cannot understand that it should be necessary to take up rails after they have been in nine years on a line in the open, where only 75 trains pass per day, unless indeed this is due to one or more of the following causes: Too light a rail for the weight of the traffic, a rail rolled too hot, or too soft a steel. Probably metal sleepers, owing to their hardness, are conducive to a more rapid wear of the rails.

The figures given by Mr. Labordère show that on a busy line with heavy and fast traffic, a metal sleeper in Germany would have a shorter life, by one-half, than a creosoted and oak sleeper on the Belgian State Railway (with a rail weighing 104.83 lbs. per yard. It seems therefore that for the lines which we are at present considering, creosoted hard wood sleepers are not at all likely to be replaced by metal sleepers. It is probable that on lines with a medium amount of traffic or situated in hot or damp countries, the contrary would apply.

Metal longitudinal sleepers have disappeared from all lines with fast and heavy traffic; they are now only of historical interest.

Weight of Rails.

Everywhere on lines with fast trains, a tendency to increase the weight of rails is observed; it is, however, worth mentioning that some railroads still have rails weighing 60.48 lbs. per yard in use on such lines. Thus the French Northern Railway will only have removed the last in 1905. These rails, which are 26 ft. 3 in. long and are supported on 11 or 12 sleepers, may even have their heads worn to a certain extent and still be sufficiently safe. It is true that the heaviest wheel-load on that line only amounts to 8.1 metric tons, and that the fast and heavy trains are hauled by four-cylinder compounds, acting two and two on two driving axles.

These powerful and well-balanced engines are very stable, even at speeds of 74.6 miles per hour, and impart very little irregular movement to the vehicles hauled. The destructive action of the rolling loads on the track is thus reduced to a minimum, in spite of the great tonnage and great speed of the trains.

The reporter recalls to mind several runs he made in 1882 on locomotives hauling international trains between Ghent and Mechlin. When he stepped down from the locomotive at Mechlin, after a run of 35 miles in about 50 minutes without a stop, he remained absolutely deafened for some moments, so violent had been the noise, the oscillations and the vibrations of the locomotive, although it had inside cylinders.

Twenty-two years later, he went from Hal to Brussels on a four-cylinder compound with six wheels coupled, of the French Northern type, hauling a 210 ton train at a speed of 49.7 miles per hour; the smoothness of running was remarkable and to be compared with that of the carriages of 1882.

If we assume the weight and amount of traffic and its speed to be constant, then the better the construction of the rolling stock the lighter the rail that can be used and the less the rail will become worn.

For heavy and fast train traffic, however, heavy rails show many advantages as compared with light rails. It has been found on the Belgian State Railway that the wear of the 76.60 lbs. per yard rails amounted to about one millimeter per 70,000 trains (Vesdre line), whereas that of the 104.83 lb. per yard rails was one millimeter per 120,000 trains; this was determined by very careful measurements made on the flats and gradients of the Luxemburg line (ascents and descents of 1.6 per cent.), and on the lines from Brussels to Ghent and from Mechlin to Antwerp. Here practically the same rolling stock was used, and Bessemer rails made at the same steel works. The steel is a little too soft; it has an ultimate tensile srength of 38.10 tons per sq. in. and an elongation of 13 per cent.; its average chemical composition is 0.75 per cent. of manganese, 0.44 per cent. of carbon and 0.08 per cent. of silicon, sulphur and phosphorus. (The rails now rolled are of harder metal and have an ultimate tensile strength of 44.45 tons per sq. in.; specified minimum, 41.27 tons per sq. in.)

The heavier rails break less than the lighter rails (transverse fractures).

In 1903 there were taken out from the main lines of the Belgian State Railway, on account of transverse fractures, 401 of the light, 76.60 lb. per yard rails, and nine of the heavy 104.83 lb. per yard rails. Now, of these main lines 4,970 miles are laid with 76.60 lb. rails and 870 miles with 104.83 lb. rails. It is however true that the average age of the 76.60 lb. per yard rails broken is about 20 years or even more, whereas the average age of the 104.83 lb. per yard ones is only 13 years.

Sixty-three of the 104.83 lb. per yard rails were taken out during 1903 because they showed longitudinal fractures due to large blow-holes. In such cases the crown began to flatten gently, and then part of the head flaked off; we intend to return to the subject of such fractures in the chapter on the manufacture of steel.

Other things being equal, it has been determined on the Belgian State Railway system, that less maintenance was required for the track with heavy 104.83 lb. rails than for the track with 76.60 lb. per yard rails. On the busiest lines only one man is required for every two kilometers (1.2 mile) of single track.

Such rails are therefore to be recommended where a very busy traffic makes maintenance difficult and where labor is costly.

If plenty of capital is available at a cheap rate, and when steel is cheap and the concession of the company has a long time to run, it seems an advantage to use very heavy rails for busy lines with fast traffic. Moreover, when a heavy rail has lost about 10 per cent. of its weight by wear, it may be re-rolled; thus a rail is obtained the steel of which is improved because it could be rolled at the low temperature desired (850 deg. C. [1,562 deg. Fahr.]).

The weight of the rail varies on the different railroads between a minimum of 60.48 lbs. per yard (older types) and a maximum of 104.83 lbs. per yard. It may be said that the rails now supplied for first class railroads, over which heavy trains run at a speed of 74.6 miles per hour, weigh between 86.68 and 104.83 lbs. per yard.

Rails With Inclined Web and Rails With Vertical Web.

The web is as a rule inclined about 1 in 20, so that a new tire is in contact with the middle of the rolling surface of the crown. Only two Austrian railroads and the Belgian State Railway set the rails so that the webs are vertical; this is also the general practice in the United States of America. This is no serious disadvantage as far as the wear of the crown is concerned, but we think that this practice leads to abnormal wear of the tread of the tire, near the flange, during the years which elapse until the rolling surface becomes worn down to an inclined plane. Moreover, when a wheel runs over a rail, the rail is canted, and as a consequence the inside fishplate has to support the greater part of the stress due to the bending at the fishjoint, if the joints are suspended joints with weak fishplates, those on the inside become broken in a few years (outside fishplates very seldom break). In America, where the rails are also set with the web vertical, fishplates break equally frequently; such fractures do not occur so frequently with the rails inclined, and on such there is probably no difference between the numbers of fishplates broken inside and outside.

We only see disadvantage and no advantages in setting the rails with the web vertical.

Width of Crown and Curvature of Its Surface.

The width of the crown varies from 2⅜ to $2^{21}/_{32}$ in.; it would perhaps be an advantage to have it still wider, as at present tires are materially wider and wear hollow. If the width of the rail was a little less than that of the tread, say $3^{17}/_{32}$ in., the taper of the tire would be better maintained and the wear of the two articles in contact (tire and rail) would probably be reduced.

There are other advantages in widening the crown, as we shall see later on.

On two of the railroads, the French Northern and the French Eastern, the central part of the rolling surface is flat over a width of ⅞ in.; on the Lancashire & Yorkshire this flat has a width of $1^{9}/_{16}$ in. All the other railroads have this surface curved; average radius, $7^{3}/_{32}$ in. Soon after the rails have been put in this curve disappears, but not without damaging the tires by producing hollows in them. We think that the three railroads which form the exceptions are in the right and that the English railroad, the Lancashire & Yorkshire, has the best arrangement. The ideal would be to have a plane surface in contact with the tire over as great a width as possible; the mutual wear of the rail and of the tire would keep the tread of the latter conical over its whole width.

The corner between the rolling surface and the vertical sides of the head may be rounded off to a radius of $^{25}/_{64}$ in., as found on worn rails (the Paris, Lyons, Mediterranean has a radius of $^{5}/_{16}$ in. only).

Thickness of Head.

It is useless to give too much thickness to the head. With rails which have a strong cross-section, and are made of hard and tough steel, the wear does not amount to 0.04 in. per 100,000 or 120,000 trains. On busy lines with fast traffic where the weight of the trains and the wheel-loads are not

excessive (and this applies to all the railroads which we are considering) it is enough to have as minimum 1⅝ in. at the thinnest part. The rails on a line in the open will then not require to be taken out, on account of the wear of the head, till after 50 years.

Inclination and Size of the Surfaces on Which the Fishplates Bear.

The inclination varies between ½ (general practice) and ⅛ (Belgian State Railway); the greater the inclination the more work the bolts have to do. The inclination on the Belgian State is too small. What happens is, that by the mutual wear of the fishplates and the surfaces on which they bear, the vertical face of the fishplate soon comes in contact with the web of the rail; the inclination of ⅛, however, is enough for the flange, for the surfaces there are in contact over a width of $1^{27}/_{32}$ in., as compared with a width of $^{9}/_{64}$ in. under the head. It seems rational to have two different inclinations for the head and for the flange. The Vignoles rail of the Victorian Railways shows this peculiarity; the inclination is ⅛ under the head and ⅛ on the flange.

A small inclination of the bearing surfaces (*e. g.* ¼) gives, other things being equal, a tighter fishjoint than a larger inclination (*e. g.* ½); the rails, if the fishbolts are drawn up tight, and if considerable changes of temperature occur, only move with difficulty relatively to the fishplates, or even not at all, and strains are thus produced which may result in fractures. From this point of view, small inclinations are suitable for very heavy rails and larger ones for too light rails. In countries where there are extreme temperatures, having too good fishjoints may produce the fracture of rails which are too light for the traffic.

When a Belgian State 104.83 lb. rail, which has been in use for a dozen years or so on a line with very heavy traffic, is examined, it is found that there is a considerable wear at the bearing surface under the head (up to one millimeter), but not at that on the flange. It is therefore advisable to increase the bearing surface under the head; this may be done by making the head considerably wider, *e. g.* $3^{17}/_{32}$ in. wide.

This wear at the surfaces on which the fishplates bear, can also be reduced by using rails made of a little harder steel (having an ultimate tensile strength of at least 44.45 tons per sq. in.) and stronger fishplates, made of harder steel. The fishplates at present used are of very mild steel and become worn very quickly near the joint; but as soon as this wear has been produced, the joint becomes unsatisfactory, owing to the play between the fishplate and the rail, and the blows produced by rolling loads then deform not only the fishplate but also the rail.

Web of the Rails.

The thickness of the web of the Vignoles rails varies from $^{15}/_{32}$ to $^{42}/_{64}$ in. The web of double-headed rails is as a rule thicker and goes up to $^{28}/_{32}$ in.; the web of these rails is subjected to more wear where it is in contact with the jaws of the chairs.

In order to increase the stiffness of the rail, it is advisable to increase as much as possible the height of the web. This varies from $3^{5}/_{32}$ to 4⅛ in. (Victorian Railways) (measured from bottom of head to bottom of flange). A considerable height of web makes it possible to use fishplates having a large moment of resistance.

Flange: Thickness and Width.

The Vignoles rails which have the part of the flange on which the fishplate bears at a considerable inclination, have the upper surface of the flange hollowed. This shape is a very advantageous one for rolling, because the volume of the flange approaches that of the head; there is less danger of splitting the flange when the rolling is done at a low temperature. On the other hand, the width of the surface on which the fishplate bears is reduced, and a small inclination seems to be better for resisting the action of the fishplates. Heavy Vignoles rails with the bearing surface at an inclination of ⅛ must have the flanges not less than $^{33}/_{64}$ in. thick at their thinnest point, particularly in the case of rails supported on steel bedplates, as the flanges of such rails become appreciably worn just over the bedplate (about ⅛ of the wear of the head). Moreover, heavy rails having a thick flange are easier to roll and are of better quality than those with thin flanges, as the former can be rolled at a lower temperature without risk of splitting the flanges. We do know that if we compare two rails made from the same ingot, one rolled at a low temperature not exceeding about 850 deg. C. (1,562 deg. Fahr.), the other rolled at an appreciably higher temperature, say 950 deg. C. (1,742 deg. Fahr.), the former will prove to be of better quality.

The flange may have less width if the rail is supported on steel bedplates. Of the railroads which do not use steel bedplates, the French Eastern has the narrowest flange relatively to the height of the rail (width of flange, 5⅛ in.; height of rail, $5^{9}/_{16}$ in.), and the Victorian Railways the widest (width of flange, $5^{19}/_{32}$ in.; height of rail, 5⅞ in.).

Of the railroads which use steel bedplates, the Austrian North Western has the narrowest flange (width $4^{3}/_{32}$ in.; height of rail, $5^{15}/_{32}$ in.).

Bedplates.

Most of the railroads using Vignoles rails support them on steel bedplates; the French Northern and French Eastern support them on slabs of felt or of creosoted poplar wood; the two Australian railroads place the rails direct on the sleepers.

We think that the use of steel bedplates gives a harder track and promotes the wear of the rails not only at the flange but also at the crown.

We notice, if we travel from Paris to Brussels, that the trains run more smoothly while on the track of the French Northern than while on that of the Belgian State, although they are going faster when on the former and although the track of the Belgian State is the more solidly built one. There is no appreciable difference in the hardness of the ballast used; the French Northern uses broken slag, the Belgian State broken porphyry; the difference in the smoothness of the running can only be due to the fact that the Belgian State uses steel bedplates.

The following is what is observed on a line of the Belgian State Railway, which had 104.83 lb. rails put in 12 years ago, and over which 85 trains run per day: minimum wear of one millimeter at the horizontal surface of the bedplate and of that part of the sole of the rail in contact with it. As the bedplate has a border on to which the head of the screwspike takes, a border which does not become worn as much as the bearing surface of the rail and bedplate the inner side of the head of the screwspike is no longer in contact with the upper surface of the flange of the rail, and the play between the two makes it possible for the track to spread from $^{9}/_{32}$ to $^{29}/_{64}$ in. The outside vertical edge of the flange works into the vertical part of the bedplate to the extent of $^{13}/_{64}$ to $^{15}/_{64}$ in.; the flange on the inner side is then no longer held by the screwspikes, and the passage of rolling loads produces a hammering effect of steel against steel. This quite explains the less smooth running on the track of the Belgian State Railway. It would seem that greater wear of the head should also result, but this is difficult to control experimentally, as the conditions of working and of hauling are so different on the French Northern and Belgian State Railways. Moreover other factors, such as the hardness of the rails and their moment of resistance, and the tonnage of the trains, come into play and it is impossible to eliminate them; it is, however, observed that the 86.68 lb. rails of the French Northern show for the same number of trains (but weighing less) a somewhat smaller amount of wear at the head than the 104.83 lb. rails of the Belgian State (the latter show one millimeter [0.04 in.] per 120,000 trains and 60 millions of tons hauled.

According to Haarmann, the rails of the Prussian State (between Cologne and Hamburg, near Osnabrück), the hardness of which may be compared to that of the rails of the French Northern (ultimate tensile strength 44.45 tons per sq. in.) and which weigh 82.65 lbs. per yard and are supported on strong bedplates, become worn at least one millimeter by 45,000 trains, representing about 24 millions of tons hauled; whereas the 86.68 lb. rails of the French Northern, between Paris and Creil, as supplied by steelworks A, only become worn one millimeter by 160,000 trains, representing about 48 millions of tons hauled. Rails supplied by another steelworks B, which were made of softer steel, became worn one millimeter by 120,000 trains, representing 36 millions of tons.

It is, however, observed on the Prussian State Railway, that the tracks with metal sleepers give practically as smooth running as the tracks with wooden sleepers and strong bedplates, and that the wear of the heads is about the same in both cases. Does this not rather show that steel bedplates will make tracks so hard that they will approximate to tracks on metal sleepers?

On the section of line referred to above, between Mechlin and Antwerp, it was found that the intermediate sleepers with bedplates show twice the amount of impression as the joint sleepers; the latter have no bedplates. The two joint sleepers are protected against having the flange of the rail driven into them by the horizontal flanges of the supporting fishplates; but at certain parts of the track, two pieces of fishplate were bolted to the web of the rail and secured to the two middle sleepers, in order to prevent creeping; the impression on even those middle sleepers was less deep, and the sleepers were in as good a state as those which had bedplates on them. This method of securing the rails to the sleepers by means of pieces of fishplate will probably replace bedplates, with considerable advantage.

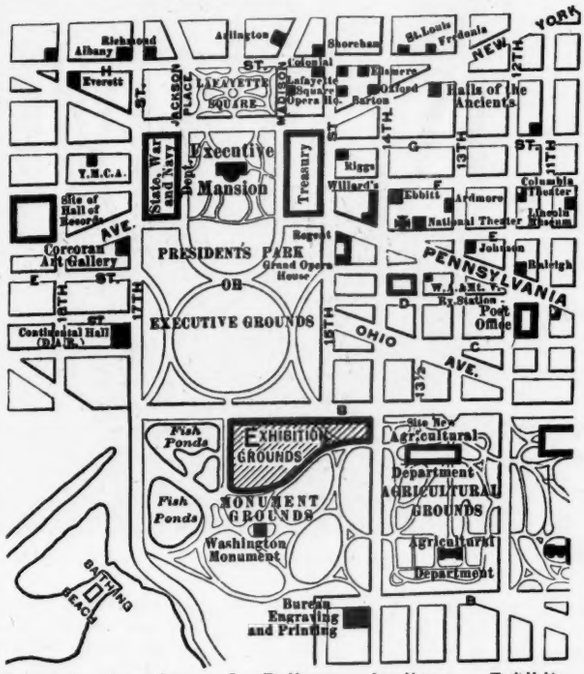
Another disadvantage, but a slight one, of bedplates is that they facilitate creeping, for very soon the wear of the bedplate results in having some play between the edge of the screwspike and the flange, and the rail slides more easily on a worn surface of steel than of wood. As a rule, the railroads which use Vignoles rails with or without bedplates have succeeded in counteracting creeping; that disadvantage of bedplates is, therefore, among those which are of minimum importance.

Besides these disadvantages of the steel bedplates, there are also sundry advantages which have led to their adoption. We think that they are very useful, perhaps even indispensable, in the case of soft wood sleepers; but if the sleepers are of beech or of oak, the disadvantages of metal bedplates seem to outweigh their advantages.

(To be continued.)

Exhibits at the International Railway Congress.

Mr. George A. Post, Chairman of the general committee on arrangements for the American Railway Appliance Exhibition to be held in Washington, D. C., in May, 1905, in connection with the meeting of the International Railway Congress, has been in Washington since December 5, in company with Mr. J. Alexander Brown, Secretary and Director of Exhibits, presenting the matter before Congress. It was necessary to have passed by Congress a special act authorizing the Commissioners of the District of Columbia to permit the proposed exhibition to be held on the site selected, known as the White Lot. Mr. Post and the members of the committee on arrangements have been working since last summer in the interests of the exhibition and have made strong appeals to the members of Congress for the passage of such an act. On Monday, December 12, the Senate passed the necessary joint resolution after it had been unanimously approved by the members of the District of Columbia Committees of both the house and the Senate. In the house the vote in favor of the resolution was unanimous with the exception of Congressman J. R. Mann, of Chicago, who bitterly opposed the passage of the resolution and resorted to filibustering tactics to defeat it, finally raising the point of "no quorum" in the House, which temporarily retarded the passage of the bill. Mr. Post, however, has assurances from the leaders of the majority and minority sides of the House of Representatives that the resolution will come up again on Monday, December 19, which is known as "Suspension Day" when bills may be passed by a two-thirds vote. It is confidently expected that at that time the further opposition of Mr. Mann will prove futile.

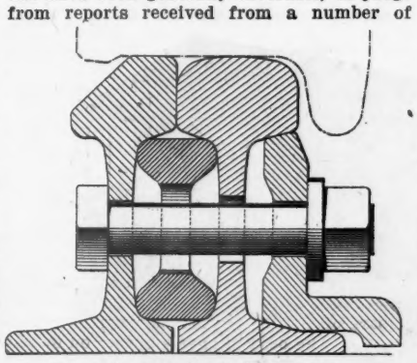


Proposed Location of Railway Appliance Exhibit, Washington.

The exhibition assumes all liability and must have all of its plans approved by the Secretary of War.

Improved Barschall Rail Joint.

The Barschall wheel-carrying rail joint in its original form has been extensively tried in Europe and to a limited extent in this country and although it has some objections, on the whole, the results obtained from its use have been generally favorable, to judge from reports received from a number of roads in Germany and Austria which have the joints in track. One road which has an experimental stretch of track 12 miles long laid with these joints, put them in only after expensive trials of flat-plate joints and angle bars. The line was originally laid in 1885 with 78-lb. rails, 25 ft. long with flat-plate joints. The ends of the rails became battered and worn out while the body of the rail was in good condition. Angle bars were tried with no better results and in 1899 the Barschall type of supported joint was put in. The results have been very satisfactory and would seem to indicate that where the ends of the rails have been battered and worn out while the remainder is in good condition, a supported joint can be used to good advantage. The cost of maintenance of track fitted with these joints is about $16 less per mile per year than for adjoining sections of track laid with angle-bar joints.



Improved Barschall Rail Joint.

Those roads which have used this type of joint are almost unanimous in saying that the riding qualities of track fitted with them are greatly improved, that there is less wear-and-tear on rolling stock and that the rails themselves last longer than with the ordinary angle bar joints. The one objection to the old form of joint which is in use so extensively in Saxony and Bavaria is the effect of false flanges worn on wheels, which batter down the outside or supporting rail. The efficiency of a joint of this kind depends on two conditions; false flanges clearing the joint, outward and downward; and the uneven tread of worn wheels being equalized by the independent deflection of the two bearers at the joint. These conditions are not entirely fulfilled by any previous forms of lapped rail-ends, joint bridges or wheel-carrying angle bars. In the improved form of the Barschall joint shown in the accompanying illustration these conditions have been met and the best features of the three types of joints referred to have been embodied in it without the inherent disadvantages of each.

In 1903, an official report on the performance of the original type of Barschall joints laid in a stretch of track on the Berlin-Halle line, commented unfavorably on them because of the destructive action of the false flanges. The width of the bearing surface at the joint on this stretch is 3⅞ in., and the head and foot of the filling piece between the main rail and the joint rail was made so wide as to partially prevent its free canting under the deflection of the rails. In this country the joints experimented with on the Pennsylvania Railroad were also too wide, being $3^{9}/_{16}$ in. across the bearing surface; yet notwithstanding this serious defect in detail the principles involved have been shown to be correct. Mr. L. F. Loree, who recently resigned from the presidency of the Rock Island, examined the experimental track near Berlin in 1898 and in his report said:

"I have found a double-track stretch on the line between Berlin and Halle on which one track is laid with Thomas steel rails weighing 41 kg. per meter (83 lbs. per yd.) with Barschall joints and the other track laid with Bessemer steel rails and angle-bar joints. Both tracks had been in use for the same length of time. The track with Barschall joints showed the joints to be in good condition but the rest of the rail in bad shape, while the other track showed the reverse, rails in good condition and joints in bad shape." Even with the faulty design of having the bearing surface too wide the wheel-carrying joint proved to be superior to the angle bar joint.

The improved joint illustrated here has been redesigned as a result of the experiments on the Pennsylvania and in Europe, and while it combines all of the principles of the original joint and some new ones it has none of the inherent defects of its predecessors. It is intended to be used with a rail section, also of new design, in which the head is not symmetrical but is ⅛ in. narrower on the outside of the web than the Am. Soc. C. E. standard section for 85-lb. rail. This brings the web of the main rail and the outside supporting rail ¼ in. closer together and the outside or carrying rail is made symmetrical with the main rail. The

total width of the bearing surface of this improved joint is less than 3 in. so that it will clear any false flange, as shown in the drawing. Shorter and therefore stronger bolts can be used. The head and foot of the filling piece being narrow, this proportionately facilitates its canting and therefore the independent deflection of the two rails.

It has been found that in all cases the outer rail carries the greater part of the load at the joint and this has therefore been correspondingly strengthened by making the base symmetrical and cutting off part of it on the inside. The flanges on the main rails are cut away on the inside at the joint and the partial inside flange of the outer rail fits into the recess so formed. This gives the outer rail additional support on the ties and the weakening of the main rail ends is not objectionable because the outer rail carries the load. The proposed unsymmetrical rail can be made by re-rolling old and battered rail in a manner similar to the McKenna process and a better and more homogeneous metal obtained than in the original rail.

Patents on this improved joint were issued to Max Barschall on November 22, last. These joints are not sold outright, but, by arrangements with the patentee, railroads can have them made anywhere. The American office of Mr. Barschall is 31 Nassau street, New York.

Three Historic Locomotives—and Some Others.

BY HERBERT T. WALKER.

It will be remembered that the Transportation Exhibit at the Columbian Exposition of 1893 included an extensive and highly interesting display of historical locomotives, illustrating the development of transportation by steam from Sir Isaac Newton's suggestion—made in the year 1680—for a vehicle to be propelled by a jet of steam working on the reaction principle, down to specimens of the locomotive engine of the present day.

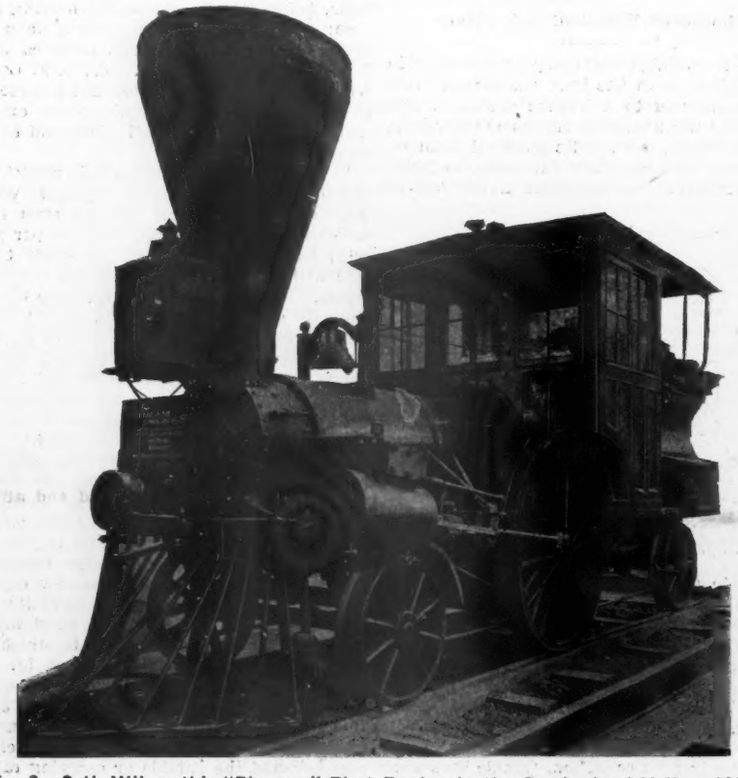


Fig. 3—Seth Wilmarth's "Pioneer," First Engine in the Cumberland Valley, 1851.

Fig. 2—The "Mississippi," First Engine in the Lower Mississippi Country, 1834.

The principal part of this representation was formed by the collection made by the Baltimore & Ohio Railroad Company, under the direction of Major J. G. Pangborn, who visited Europe as well as the leading railroads and engine builders of this country, gathering a large amount of data of early locomotives which enabled him to construct full-size reproductions of nearly all the types of early engines. Specimens of real locomotives were also secured; and these invaluable acquisitions, with the models, supplied important links in the chain of locomotive history, which, however, at that time was far from complete.

Even in its then imperfect state the display was of the highest interest and importance, inasmuch as it was absolutely unique in the history of expositions, and opened a new field in the study of railroad history—a difficult and complex subject, and one, moreover, that has never been written in book form.

This collection was bought by the Field Columbian Museum, and at the close of the exposition it was duly installed in the Museum's handsome building; and from thence it was transferred to St. Louis. In the meantime Major Pangborn had been busy acquiring additional historical material both in this country and in Europe, thus supplying missing links and forming a chain of locomotive evolution and development that is now practically complete; and it formed perhaps the most attractive section of the Transportation Exhibit at the St. Louis Fair.

Most of the more important engines now on exhibition have been previously noticed in the columns of this journal from time to time, and it is proposed in the present article to examine only the more noteworthy recent additions; though in passing a word may be said about the exhibit as a whole. This unparalleled collection of historical engines includes about sixty specimens, many of them actual engines, and the rest full size reproductions, mostly of wood. Among the landmarks of locomotive history will be found Trevithick's tramway engine of 1803; Stephenson's "Rocket" of 1829; Jervis' "Experiment" of 1832, the first engine with a leading truck; Eastwick and Harrison's "Hercules" of 1837, the first engine with equalizers; several of the original "grasshoppers" built in 1832 and subsequently; some of Ross Winans' "camel" engines; the "Buffalo" of 1844, and the "Peppersauce" of 1862.

The subject of the evolution and develop-

ment of permanent way has now received more attention than it has hitherto, and every example of motive power stands upon the track of its period—in many instances upon original rails, stones, etc.; in others on a faithful reproduction. There is also an extensive showing of tie or sleeper history.

Another novel feature is the introduction of life-size figures of contemporary engine-drivers and firemen on the different examples of motive power. It is a matter of opinion whether such an adjunct is appropriate to an exhibition of a scientific character, but the attitudes of the figures are in most cases natural, and, to the general sightseer, they probably produce an atmosphere suggestive of life and motion.

The principal historical additions to the collection since 1893 are the engine "Pioneer," contributed by the Chicago & Northwestern Railway; the "Mississippi," from the Illinois Central, and Seth Wilmarth's "Pioneer," from the Cumberland Valley Railroad. All three are the actual locomotives—not reproductions—and are a great acquisition.

The Chicago & Northwestern "Pioneer" is illustrated in Fig. 1. It is a Baldwin engine and was built in the year 1836. In 1848 it was transported by lake from Buffalo to Chicago, where it was put to work on a road that is now a part of the Chicago & Northwestern. It was the first engine seen in Chicago, and did duty altogether for thirty-five years. Baldwin built many engines of this type and they did satisfactory work. The engine before us is inside connected, with half cranks. The driving boxes and valve motion are outside, and the eccentric rods have drop V hooks. The engine weighs about 10 tons and appears to be well preserved.

Fig. 2 shows the engine "Mississippi," said to have been built in England in the year 1834, and imported to the United States in 1836. It was the first locomotive in New Orleans, and ran on the Natchez & Hamburg Railroad, now a part of the Illinois Central. In 1868 the engine was removed from Natchez to Vicksburg, where it did switching work. Then it was laid aside and became gradually buried in sand, until 1878, when it was exhumed and put to work on the Natchez, Brookhaven & Meridian Railroad, where it ran until 1891.

An examination of this engine shows that it is now probably not as originally built; neither can it be ascertained who were the builders, nor does it possess any of the earmarks of an early English built engine. Furthermore, a search through the Government Report of 1838, giving a list of locomotives used on American railroads which were imported from England, fails to show any English locomotives at New Orleans or the railroad where the "Mississippi" orignally worked. It is possible that some of the parts were purchased in England, as it is known that at least one of the minor firms of engine builders bought parts of locomotives from there, making some of the smaller fittings in their own shops, and so turning out a complete engine as of their manufacture. But however this may be, the "Mississippi" is a curious engine, with its cab the whole length of the boiler, and will repay a careful examination. The cylinders are 9½ inches diameter by 16 inches stroke; driving wheels 43 inches diameter; weight about 7 tons.

The next engine claiming our attention is the "Pioneer" illustrated in Fig. 3. This locomotive is of more than ordinary interest, for it was built by Seth Wilmarth, who was an engine builder of some note in the early fifties. His shops were situated at South Boston, and he built many engines for the Boston & Worcester, the Hudson River, the Eastern of Massachusetts and the Old Colony Railroads. His designs were generally patterned after the Hinckley engine of those days; but they had some points of originality, as for instance, leading and trailing four wheel trucks, he being, probably, the first to design this wheel arrangement, which was repeated by later builders, and was discussed in the *Railroad Gazette* of June 17 last, page 29. Fig. 6 in that article probably shows a Wilmarth engine, but the writer was not aware of it at the time.

The "Pioneer" has cylinders 9 inches diameter by 14 inches stroke, driving wheels 54 inches diameter, weight 13 tons. It is a tank engine and has a single pair of driving wheels—types of the locomotive that are not, and never were, so common in the United States as in Great Britain. The boiler has a wagon top and the steam and exhaust pipes come outside the smokebox, where they enter the valve chest at the back side. The valve chest cover is on the front side of the chest instead of the top, and neither the pipes nor chests have any lagging. The sand boxes are on the driving wheel guards, but side elevations of the engine which have been published show a sand dome on the boiler barrel, which was probably its original position. The engine has link motion. The connecting rods and other working parts are very light, but the engine was probably never used for heavy work. It was built for the Cumberland Valley Railroad in 1851, and is said to have never been changed or remodeled. As the engine ran for 40 years, this is a remarkable record.

Fig. 1—The "Pioneer," First Engine in Chicago. Built in 1836.

In order to indicate locomotive practice at exposition periods, it has been decided to include as a permanent part of this collection the Baltimore & Ohio engine "600" shown at the Philadelphia Centennial Exposition, 1876, where it was awarded a prize. This engine is said to be the first passenger mogul, and was built for "fast" traffic over mountain grades. The exposition period of 1893 is represented by the "Royal Blue" express engine "Director General," shown at Chicago in that year. This engine will also be included as a permanent exhibit. It is a Baldwin compound and is a fine piece of work.

The strictly modern examples in the B. & O. exhibit are "the Governor Francis," a consolidation engine built by the Rogers Locomotive Works; the "Missouri," an engine of the Atlantic type; and the "St. Louis," built by the American Locomotive Co., all for use on the Baltimore & Ohio. This latter is the huge Mallet articulated compound engine, and is unquestionably the most notable of modern locomotives. As particulars of all these engines have been published, it is not necessary to repeat them here.

Of the vast assemblage of drawings, photographs and models covering the whole field of land transportation by steam, it is impossible even to make mention. Some of the more recent acquisitions are four models of trains, contributed by the Egyptian State Railroads, and illustrating freight practice in that country. There is, also, a model of the Rigi Railway and several other additional models of English and other locomotive practice of the sixties and seventies. These models are, generally speaking, made to a scale of one inch to the foot.

The total exhibits in this unparalleled representation occupy something over sixty-two thousand square feet of floor space, to say nothing of all available parts of walls, column pedestals and screens, which are occupied by pictorial representations and smaller objects—the evolution and development of brake mechanism being fully illustrated.

The amount of labor involved in the collection, classification and arrangement of such a large and diverse display can only be imagined. Much credit is due to Major Pangborn and his associates for the energy and zeal they have thrown into their labors. The value of the display, from an educational standpoint, can scarcely be overestimated, and foreign attention has been thereby attracted, so that special reports are being prepared upon it at the instance of European governments.

It is gratifying to know that good progress is being made toward making of this great collection the nucleus of a permanent museum devoted to the railroad and allied interests.

No extension of the Simplon Tunnel was effected at either end during October, the work being confined to walling out the hot-water spring and providing the cooling apparatus to make it possible to resume drilling in front of it. There remained 794 ft. between the north and south headings. The water discharges from the south end of the tunnel at the rate of 190 gallons per second. About the middle of November the work of isolating this hot spring was completed, a covered masonry channel having been pro-

vided to drain it away without heating the tunnel to an insufferable degree, and cold water being conducted inward by pipes to reduce its temperature. This covered channel is a mile and a half long. If no further unforeseen obstacles are met, the contractors hope to reach the excavation from the north by the middle of January.

Western Union Loses Its Suit Against the Pennsylvania.

The Supreme Court of the United States in an opinion by Justice McKenna has decided the case of the Western Union Telegraph Company versus the Pennsylvania Railroad, involving the right of the railroad to remove the telegraph company's poles from its right of way, in favor of the railroad company. The court holds that the act of Congress of July 24, 1866, which controlled the case, does not grant eminent domain to telegraph companies over the private property of railroad companies. The case originated in New Jersey. The telegraph company contends that the necessary implication from the provisions of the act of 1866 permitting telegraph companies to use post roads is that telegraph companies may appropriate for their poles and lines a part of the rights of way of railroads on paying just compensation, may exercise the right of eminent domain. But there is nothing in it which provides for condemnation or compensation. The power of eminent domain is against common right. It subverts the usual attributes of the ownership of property. It therefore must be given in express terms or by necessary implication.

Responding to contentions on the part of counsel for the telegraph company that railroads are not essentially different from other highways, Justice McKenna said:

"This argument would seem to make a railroad right of way public property. To that extreme we cannot go. The right of way of a railroad is property devoted to public use, and has often been called a highway, and as such is subject, to a certain extent, to State and Federal control, but it has always been recognized that a railroad right of way is so far private property as to be entitled to that provision of the Constitution which forbids its taking except under the power of eminent domain, and upon payment of compensation.

"It follows from these views that the act of 1866 does not grant the right to telegraph companies to enter upon and occupy the rights of way of railroad companies, except with the consent of the latter, or by grant of eminent domain. Nor does the statute of New Jersey make those rights of way public property so as to subject them to such occupation under the provisions of the act of 1866. It is admitted that the statutes of New Jersey do not confer the right of eminent domain upon telegraph companies. It happens to be the policy of New Jersey not to grant eminent domain to telegraph companies, and a railroad's right of way enjoys in that State the same immunity from compulsory proceedings as other private property enjoys. But this has no bearing on the act of 1866, nor does it make that act, as construed by us, a grant to railroads of greater power over commercial intercourse by telegraph than the States have. . . .

"Interstate commerce by the telegraph has marched to a splendid development, although in the acquisition of the means for its exercise it has, for the most part, relied on purchase, or eminent domain granted by the States. We cannot but feel, therefore, that there is something inadequate in the argument which is based on the apprehension that the act of July 24, 1866, construed as we construe it, gives a sinister power to railroad companies. It gives no power to those companies, but that which appertains to the ownership of their property."

In a dissenting opinion Justice Harlan expressed the opinion that "it was intended by the act of 1866, in the interest of the postal service and of interstate commerce, to throw open all the post roads of the country to the use of telegraph companies accepting its provisions, subject always to the condition that the use should not interfere with ordinary travel on the road occupied."

Summing up, Justice Harlan said: "Practically the railroad corporations operating post roads, looking to their own interests and caring little for the general welfare, may give exclusive privileges in the matter of interstate telegraph communications, while the States are prohibited from so doing. Thus a railroad corporation is recognized as having more power than a State. I cannot assent to an interpretation of the act of 1866 that will cause such a result. No such result is, in my opinion, consistent either with the words of the act or with the object which Congress intended to accomplish by its passage. That act, reasonably interpreted, was, I think, intended to give a telegraph company accepting its provisions the absolute right to put its wires and poles upon any post road—a public highway established primarily for the public convenience—if the ordinary travel on such road was not thereby interfered with."

The court also decided against the Western Union in the case involving the right to condemn a part of the Pennsylvania Railroad's right of way in Western Pennsylvania and appropriate it for its lines. The contention of the telegraph company in this case, as in that involving the right of the railroad to remove the poles, was that it had the right to maintain its wires over and along the lines of the railroad company, on making compensation, so long as the maintenance of its telegraph lines did not materially interfere with ordinary travel on the roads, and that the right could be asserted by proceedings in eminent domain. This contention was denied. There was also an additional element caused by the claim of the telegraph company, as the lessee of the Atlantic & Ohio Telegraph Company, incorporated by the State in 1849, and authorized "to erect and construct works, edifices, fixtures and structures along and across any of the roads, highways, streets and waters within this State, the said works to be so placed as not to interfere with the common use of such roads, highways, streets and waters." This point was decided adversely to the Western Union, on the ground that "eminent domain cannot be delegated," and that "lessees cannot exercise it."

Railroad Shop Tools.

(Continued.)

SHAPING MACHINES.

The 16-in. crank shaper shown in Fig. 1 is made by the Stockbridge Machine Company, Worcester, Mass. The ram is of box pattern and it has a bearing in the column of 26 in. when at full stroke. The stroke can be adjusted while the machine is in motion and an index and pointer facilitate setting the ram to any desired length of stroke. The tool head is graduated and the tool slide has an automatic feed of 6 in. The table is 10 in. x 11½ in. and has automatic power cross feed of 22 in. either direction. It has a vertical adjustment of 14 in. by

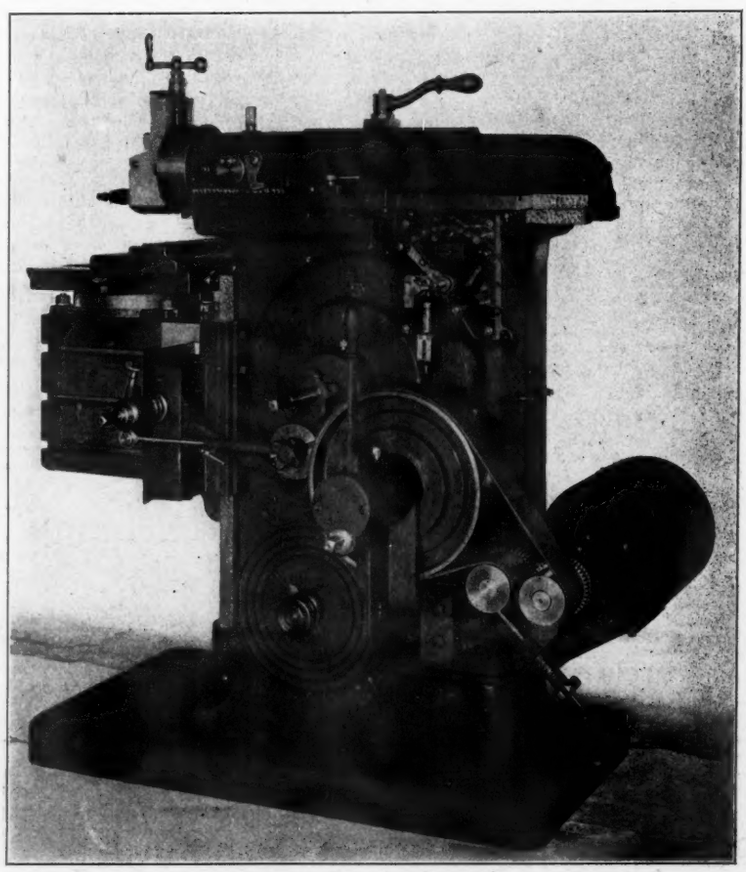


Fig. 1—The Stockbridge Shaper.

means of bevel gears and a telescopic screw. The screw is fitted with ball bearings. The vise can be set to any angle and has a graduated base. It is secured to the table by four bolts which fit into the T-slots. The rocker arm is designed so that a 3-in. shaft can be passed through under the ram for key-seating. In connection with this machine an ingenious and novel method of belt connected motor drive is shown. The driver and idler pulleys are geared together so that both drive the belt positively, and by adjusting the idler pulley by means of the adjusting screw, tension can be put upon the belt. The idler is hung on a bell crank lever which can be swung around until the belt has an arc of contact on the driving pulley almost equal to the full circumference of the pulley. It is claimed that practical tests have shown this drive to be as positive as a chain drive and more flexible. This machine is especially adapted for tool work. It is built rigidly and has a quick return stroke of 4 to 1. It is equipped with a two-piece crank motion, which gives a powerful and even cutting speed. The motor used on the tool is a 1½-h.p. variable speed Storey motor having 26 changes of speed, obtained by means of field control. There are two runs of gearing, which with the 26 speed changes make a total of 52 speed changes for the ram. This type of shaper is also made in the 20-in. and 24-in. size. The 24-in. shaper is a powerful machine and is especially adapted for the heavier work in railroad shops.

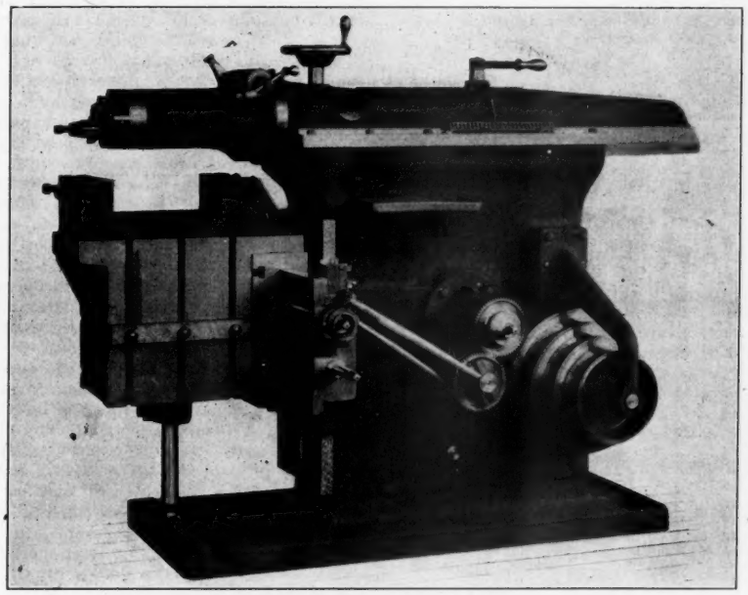


Fig. 2—The Cincinnati Shaper.

The 24-in. back-geared crank shaper shown in Fig. 2 is made by The Cincinnati Shaper Company, Cincinnati, Ohio. Both the column and ram of the machine are ribbed and braced internally and the ram slides project in front and in back of the column. The rail is ribbed horizontally and is gibbed to the column and the cross traverse screw has a graduated collar reading to .001 in. and it is also provided with a variable automatic feed which admits of changing the feed from zero to the maximum without stopping the machine. The head swivels to any angle; it is graduated and has a simple locking device. The down feed screw has a graduated collar which reads to .001 in. The vise has annealed tool steel jaw plates; it swivels and has a graduated base. This machine can be operated either as a single-geared or back-geared tool; the change of gears being obtained by a clutch operated by a lever within easy reach of the operator. The table has an adjustable roller bearing support, as shown in the illustration. Ball bearings are placed under the elevating screw used for raising the rail, thus reducing the friction to the minimum. An opening through the column under the ram will admit shafting or similar work up to 4 in. in diameter. The position of the stroke is changed by the hand wheel shown on top of the ram and the length of the stroke is adjusted by means of a crank. These changes can be made while the machine is in motion. The screws for adjusting the gibs in the down slide of the head and the ram slide are held in position by locknuts which are countersunk flush with the casting. The machine as shown in the illustration is equipped with an automatic circular feeding head and a special chuck. This device was designed primarily for machining locomotive driving boxes preparatory to forcing in the brasses. It is especially recommended for shops where the installation of a slotter is not warranted. This automatic circular feeding head can be easily detached and replaced by the regular head, when desired. The weight of the machine complete with countershaft is 3,750 lbs., and the following table gives its principal dimensions:

Extreme length of stroke	24½ in.
Vertical travel of table	15½ "
Horizontal travel of table	27 "
Greatest distance ram to table	18¼ "
Diameter of head	9 "
Feed to head	7¼ "
Length of top of table	24 "
Width of top of table	14 "
Depth of table	17 "
Length of Ram bearing in column	36 "
Width of ram bearing in column	12 "
Size of vise jaws	14x2½ "
Vise opens	10½ "
Grades to cone on machine	4 "
No. of speeds to ram	8 "
Countershaft pulleys T. and L.	14x4 "
Revs. per min. of countershaft	200

The No. 2 Fitchburg shaper shown in Fig. 3 is made by the Fitchburg Machine Works, Fitchburg, Mass. This shaper has an 18-in. stroke and the movement of the cutter bar is obtained by the "Whitworth" quick return motion; the forward movement takes about two-thirds of a revolution and the return stroke takes about one-third of a revolution. The cutter bar is 40 in. long and it has a bearing 29½ in. x 8½ in. The connecting rod is of steel and the bearings at each end of the rod are fitted with hardened steel bushings which are adjustable for wear. The top of the bed is 75 in. long by 20 in. wide. The head has a vertical movement of 5¼ in. and is provided with power, vertical and angular feeds. It is also graduated and can be set to any angle desired, and the feed screw has a micrometer attachment which reads to thousandths of an inch. The saddle has a cross movement on the bed of 28 in., and the tables have a vertical adjustment of 14 in. The maximum distance from the bottom of the ram to the top of the table is 16 in., and the top of each table measures 16½ in. x 17 in. A hole through the bed admits a 3-in. shaft for key-seating. An independent automatic circular feed is provided for the cone mandrel. Each machine is furnished with chuck and centers. These are fitted to the table with a dovetail circular base, and will swivel to any desired position. The centers swing 12 in. and will take in a piece of work 14½ in. long. The driving cone has four steps with a 4⅛ in. face; the largest diameter is 20 in. and the smallest diameter is 10 in. The countershaft has two friction pulleys, each 20 in. in diameter by 4¼ in. face; these should run from 80 to 100 r.p.m. The weight of the machine is 5,700 lbs.

(*To be continued.*)

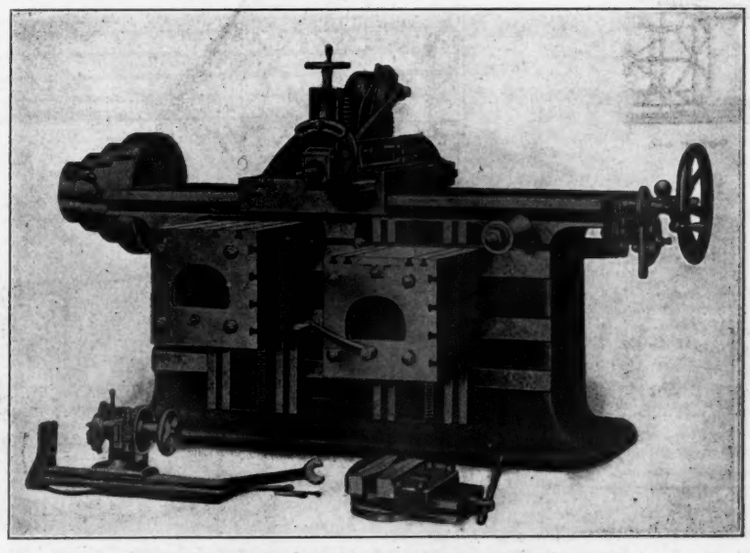


Fig. 3—The Fitchburg Shaper.

Ferry Transportation in New York.

The following statistics are taken from a paper on "Ferry Transportation," presented to the New York Railroad Club Oct. 21, by Captain J. M. Cherry.

The ferries enumerated below constitute the services to and from Manhattan Island. The figure following the name of the company gives the number of passengers carried annually:

Brooklyn Ferry Company	33,910,000
Hoboken Ferry Company	31,990,000
Union Ferry Company	30,500,000
Pennsylvania R. R. Ferry Company	30,300,000
Erie R. R. Ferry Company	16,667,252
Central R. R. of N. J. Ferry Co.	10,650,000
S. I. Rapid Transit Ferry Company	7,900,000
Long Island R. R. Ferry Company	15,625,000
West Shore Ferry Company	5,865,000
Nassau Ferry Company	2,678,000
N. Y. & South Brooklyn Ferry Co.	1,715,000
Fort Lee Ferry Company	1,700,000
N. Y. & East River Ferry Company	4,309,000
P. R. & Bergen Point Ferry Company	550,400
Babylon & Oak Island Ferry Co.	10,000
	194,369,652

The average number of passengers entering and leaving the city daily by ferry is 532,520.

The following comparison shows the respective fuel consumption of four different types of ferry boats, selected as characteristic. The figures were taken in the month of June.

	Cent. R. R. of N. J.	Erie Railroad.		
Ferryboat	"Plainfield."	"Susquehanna."	"Tuxedo."	"McCullough."
Type of engine	4 cylinder triple. 19-in., 30-in., 2 35-in. 30-in. stroke.	Beam engine. 50-in. cylinder. 10-in. stroke.	Fore-and-aft comp. 2 18-in. x 38-in. 30-in. stroke.	Fore-and-aft comp. 36-in. x 50-in. 28-in. stroke.
Coal per trip	445 lbs.	348 lbs.	458 lbs.	517 lbs.
Seating capacity	427	225	799	400
Team capacity	18	18	18	18

This shows a difference of 31 lbs. per trip in favor of the triple as against the fore-and-aft compound. This does not work out so in every case, as, by comparing a number of the four-cylinder triples with fore-and-aft compounds, we find the difference but very slight in favor of the four-cylinder tripie.

The most economical ferryboat in operation to-day is the beam engine. It does not, however, give as good results as the propeller boat, nor does it furnish the seating capacity for passengers. We find that the most expensive boat to operate is the single engine as shown in above statement. It is also an unsatisfactory type of engine for ferry service for the reason that in stopping and backing it is slow to respond.

Scherzer Bridge for the Newburgh & South Shore.

The Newburgh & South Shore Railway forms the connecting link for the heavy traffic between the furnaces of the American Steel & Wire Company, on the east bank of the Cuyahoga River, Cleveland, Ohio, and its wire mills at Newburgh. The road crosses the Cuyahoga River, which is a navigable stream; a movable bridge was, therefore, required.

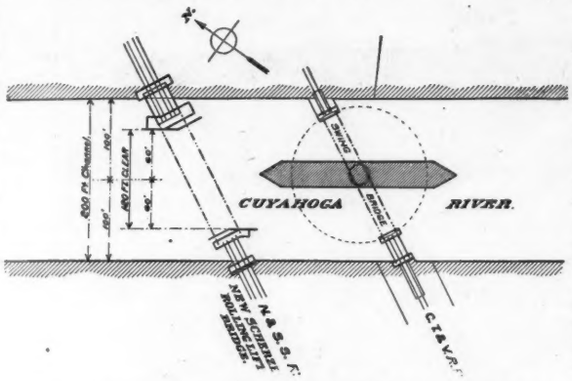


Fig. 1—Location Plan of Scherzer Bridge at Cleveland.

The Scherzer type was finally selected, and a double-track bridge was ordered. A plan of the bridge site is shown in Fig. 1, from which it will be seen that the crossing is quite close to the center-pier swing bridge of the Cleveland Terminal & Valley R. R.

The requirements of the City of Cleveland and the War Department called for a clear channel 120 ft. wide, measured between protection fenders, at right angles to the center line of the river. This necessitated a movable span of 160 ft. from center to center of bearings, as the new bridge crosses the river at an angle of 60 deg. 30½ mins. It is the longest span Scherzer bridge yet built. The general design of the bridge is shown in Fig. 2 and a photograph of the completed bridge in Fig. 3. In Fig. 4 the bridge is opened an amount sufficient to permit the passage of a moderate sized vessel. It is only necessary to open the bridge fully for the passage of large masted vessels.

There are a number of new features in the design of this bridge. The movable superstructure is composed of a single-leaf simple truss span, having a length of 160 ft. from center to center of bearings. It differs from some of the former Scherzer railroad bridges in that the operating machinery and electric motors are placed upon the movable span. The pinion at the center of the rolling segment engages with a rack, which is fixed and supported alongside of the track girder. This improvement tends to shorten the total length of bridge required and simplifies the machinery and operation. The bridge is designed in accordance with Cooper's E 50 specifications, to carry two 177½-ton locomotives, followed by a uniform load of 5,000 lbs. per lineal foot on each track. The operating power consists of two 50-h.p. continuous current motors, but the bridge, although a large one, operates so easily that less than 20 h.p. is actually used in ordinary weather. The tracks are interlocked with the mechanism for locking the bridge so that the operator cannot open the bridge until the proper signals and derailing switches are set to prevent the passage of trains. The bridge is counterbalanced so as to be at rest in all positions, and when closed forms a simple rigid truss span resting firmly on two supports. The rails weigh 100 lbs. per yard, and are firmly fastened at all points.

The piers are Portland cement concrete resting on piles. The piles for the two main piers are cut off at the bottom of the channel, and those for the rear pier and abutments at a considerably higher level. The entire work was in charge of Mr. H. L. Schuler, Chief Engineer of the Newburgh & South Shore. The Scherzer Rolling Lift

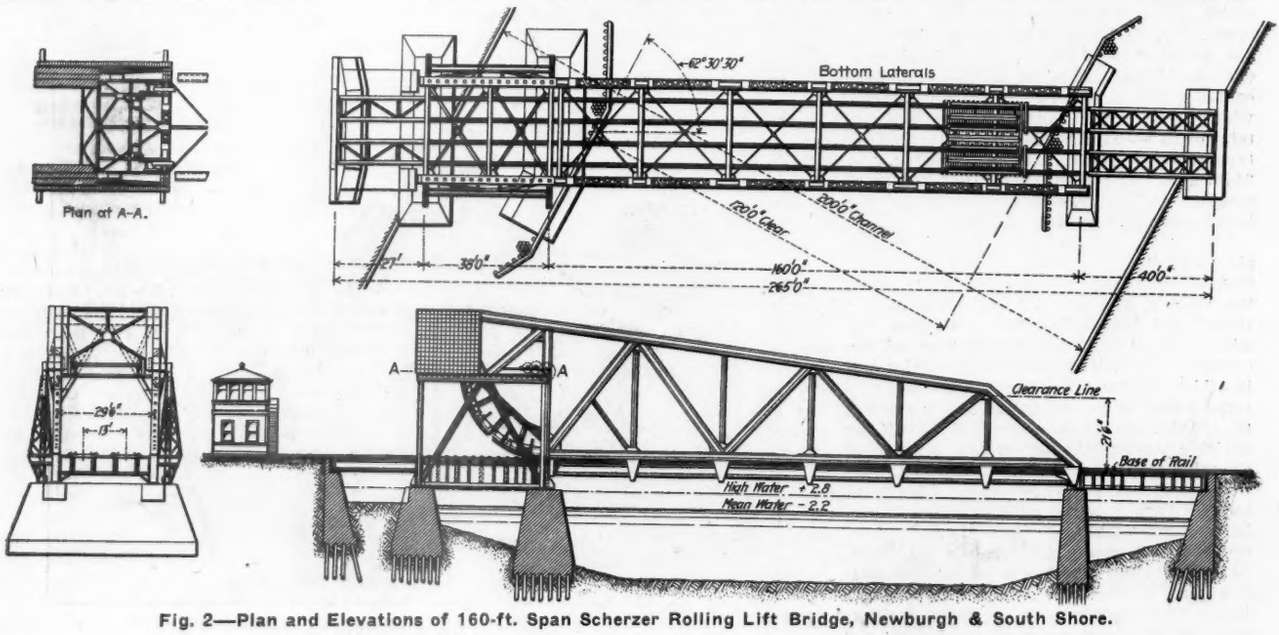


Fig. 2—Plan and Elevations of 160-ft. Span Scherzer Rolling Lift Bridge, Newburgh & South Shore.

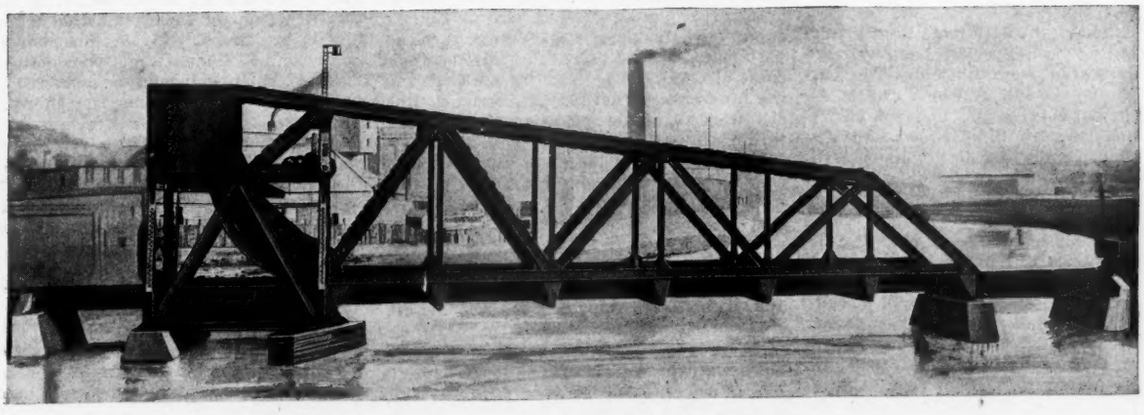


Fig. 3—Scherzer Rolling Lift Bridge Closed, Newburgh & South Shore.

Bridge Company, Chicago, furnished the detail plans for the substructure, superstructure, operating machinery and operating equipment. This company also maintained a general consulting engineering supervision over the construction of the bridge. The American Bridge Company built the superstructure. The L. P. & J. A. Smith Company, Cleveland, was the contractor for the substructure, and the Union Switch & Signal Company installed the interlocking.

Fig. 4—Scherzer Rolling Lift Bridge Open, Newburgh & South Shore.

Impact Tests on Wrought Steels.

Messrs. A. E. Seaton and A. Jude on November 18 read before the Institution of Mechanical Engineers (London) a paper on "Impact tests on the wrought steels of commerce," in which they detailed some of the characteristics and peculiarities of the wrought steel supplied by steel makers for commercial purposes. One of the objects which the authors had in view in the preparation of their paper was to assist in the development of a more rational method of testing the suitability of such steels for each particular purpose of the engineer. They also pointed out a few of the peculiarities that are observed in the fracture of test specimens and actual pieces of machinery. Although there has of late been a considerable movement made towards the establishment of a shock test for steel, conducted on a smaller scale than is the custom with axles where the full-sized article is tested, this movement is progressing too slowly, and the aggregate part of Messrs. Seaton and Jude's paper was to help towards a further appreciation of this valuable test. Ten different tests that can be made on most pieces of metal (steel in particular) were given, and the general uses to which steel may be put were divided into three main groups, the authors proceeding thereupon to decide which of the specified tests was really a true universal gage of the suitability of a piece of steel for any purpose to which it may be put. As a help to answering the question, attention was drawn to an analysis of stresses in the steel parts of an up-to-date steam engine of moderate size, which showed that 87.6 per cent. of the whole engine was subject to more or less shock, while pure tension formed an insignificant percentage of the total stress. The authors showed that vibrato.y or alternating stress where the transition from one kind to another was gradual (say following a sine law), and unaccompanied by shock, did not occur at all under normal conditions, although it might occur under ideal conditions, in the crankshaft. Though this related to only one machine, it was stated that if others were examined, it would be found that nine out of ten are working under similar conditions.

Though it is true that opinions differ as to the best means of making the impact test, on the whole the consensus of opinion appears to be that it should be made with a machine that breaks at one blow, and at the same time measures the energy expended in breaking the specimen. From the very many bars that the authors had tested they found that the number of blows to produce fracture was a fair gage of the toughness or anti-brittleness; but there is no relation whatever between this result and the tensile results except that if the impact result is good, the elongation is sure to be good too, but, on the other hand, a steel showing high tensile strength and good elongation may be useless to resist shock. The authors made their tensile tests in a Buckton testing machine, while the shock tests were carried out in an apparatus designed by them which required, as a rule, more than one blow to produce fracture, for they contended that the apparatus to test the endurance of a material under shock should not be one in which the sample was fractured at the first blow, especially for steels that are soft and are really very tough. Such a test may, however, be instructive and actually necessary for very high carbon steels.

The maximum shock strength for the particular grade of steel containing 0.25 per cent. of carbon is 30 blows as gaged by the author's machine, but, while this may be a fair figure, such steel cannot be relied upon to give this always. With the usual factors of safety considered by authorities to be sufficient, Messrs. Seaton and Jude find that for those parts subjected to more or less shock, there is a grave risk of breaking under the modern conditions of high speeds. They urged engineers to demand of the steel-maker a greater attention on his part to produce and supply the ordinary grades of steel with a more uniform "shock" quality. The nature and peculiarities of the fracture of mild steel by shock formed the subject of a large part of the paper, the matter being gone into in some detail and accompanied with many photographic illustrations showing effects of impact tests on cast steel, mild cast steel (Pearlitic), forged steel, fractures in service, and fractures at right angles to surface due to alternating stress.

The prize of 6,000 marks offered by the German Society of Mechanical Engineers for the best scientific treatise on locomotives has been awarded to Professor von Borries, who has been assisted in the work by Professor Sommerfeld, of Aix-la-Chapelle, and Herr Berner, of Berlin.

The Burlington's "Seed Special."

On Wednesday, the 14th inst., the Burlington started a "Seed Special" train through eastern Nebraska from Lincoln. The purpose of the movement, of which this is the first stage, is to give the farmers of Nebraska, and later of Illinois, Iowa and Missouri, an opportunity of placing themselves more closely in touch with the agricultural and experimental departments of their state universities, and getting the benefit of the systematic and practical study of corn raising, and the tests that are being made constantly at these institutions.

The tour now in progress will occupy seven days, and will be continuous except for the stops at the different points where the lectures are delivered. The special includes two private cars, occupied by Professor T. L. Lyon, of the University of Nebraska; Professor Holden, of the University of Iowa; Professor Hopkins, of the University of Illinois; a representative of the University of Missouri, and by officers of the Burlington. A large coach has been equipped as a lecture room, with charts and maps about the walls, with other corn data, and with equipment for making practical tests determining the germinating power of seeds.

At the stops, of which 66 are scheduled for the tour, the train is halted conveniently near the depot. All communities are advised in advance of the arriving time of the train, so that there will be no delay in getting an audience. After the lecture is delivered, the auditors are supplied with printed copies of it, and with other literature, provided principally by the university of the state in which the special is then traveling.

In January, probably about the 10th, the special will move into Illinois, and spend some time there. In February it will tour Iowa; in the early part of March go to Missouri; and in the latter part of March it will go back to the semi-arid district of Western Nebraska, and possibly on to Wyoming. On this latter trip the special will work in conjunction with not only the Agricultural Department of the University of Nebraska, but with the Plant Pathology Division of the United States Department of Agriculture, the purpose being to give additional impetus to the present rapid reclamation and development of the semi-arid parts of Nebraska, and, perhaps, Wyoming. On this trip, in addition to the lectures, and the circulation of literature on seed corn and soil inoculation, there will be, for the first time, a general and generous distribution of Professor Moore's nitrogen bacilli, together with packages of Russian wheat, from the semi-arid districts of Russia and Algeria, and of Kersten oats, which latter, experiments have proved, are adapted quite admirably to such soil and latitude as those of Western Nebraska. In the sections referred to the farmers have raised 25 to 30 bushels per acre of macaroni wheat, and an even larger percentage per acre of Kersten oats. It is the claim of the agricultural departments of the state universities that these districts can be made as productive as the famous macaroni wheat district of Russia, where climatic conditions and the nature of the soil are exactly similar.

Last fall the Burlington operated, in Iowa only, a seed special in which the farmers took such active interest, and from which they seemed to receive so much of a helpful nature that this year the road and the agricultural departments of the state universities referred to decided to widen the field and, with it, the scope of the work, the single aim of all effort being to have the farmers co-operate more closely with the institutions where farming has been made, in reality as well as in theory, a practical science. The special is under the general supervision of W. K. Manss, Industrial Commissioner of the Burlington.

To Expedite Per Diem Cars.

The following outline of instructions for carding foreign cars, when received, has been sent to us by Mr. F. L. Hutchins, of the Boston & Maine. From his statement we gather that in its main features it has lately been adopted on the B. & M. The proposition to avoid unnecessary expenditure of time by putting cards on cars without stopping to write in the number and initials of the car seems to be a sensible labor-saving expedient. Concerning the proposal to have penalty dates shown on all lists we are not so sure.

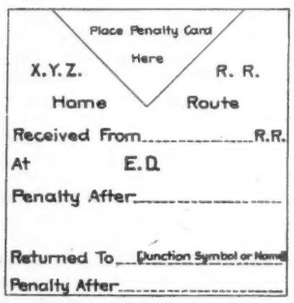


Fig. 1.

Fig. 2.

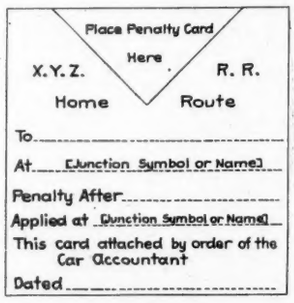


Fig. 3.

Every per diem car should have attached to each side, under or near the number, a home route card (Fig. 1), which would indicate by color, or by name, the railroad from which received, the junction symbol, or name (preferably the former), and a date, not less than 20, nor more than 25, days ahead of the day of receipt.

Should any car thus carded be upon our road at the expiration of this time, namely, upon the date shown by card, a red penalty diamond (Fig. 2), having the word PENALTY in conspicuous letters, is to be tacked above the home route card upon both sides of the car. After receiving this penalty card the car is to be hurried to the home route without diversion or unnecessary delay.

When the car goes on to another road to reach its destination, the cards are not removed when delivering to the connection; and if it returns with the cards attached, they are to be stamped with the junction symbol, and the date then in use, i.e., 20 days (or more) ahead of the current date, thus informing all parties handling the car that it belongs at such a junction for home, that it was there received from connection, and that it should not be detained or diverted, but that it must be delivered to the indicated road before date last shown.

In case cards have been removed while on the connection, the station records should show the junction symbol and date, so that the car could be carded with a blank home route card (Fig. 3), properly filled out and handled without the delay incident to asking car accountant for the information.

When cars are delivered to home route particular care must be taken to remove all home route and penalty cards.

To insure the effective working of this method, and to prevent all liability to nonperformance, all yard men should be required to note the junction symbol and the penalty date on all car lists taken by them.

Should any per diem car lack the proper home route card, the car accountant should be informed by wire. He would then give the proper junction and date and the blank home route card (Fig. 3) would be filled out and attached, and the defect taken up with the proper party to cure such omissions.

Should the home route cards upon any car show a passed date and yet lack the red penalty diamond, the first yard man discovering same would supply the defect and notify the car accountant. The matter can then be taken up with the party who had charge of the car at the date of expiration.

To facilitate the work of attaching these home route cards at junction points the writing of initials and numbers on cards should be omitted. Carders should have a stamp showing junction symbol, with removable dates. With these they can stamp up cards ahead for quick use. The stamp conduces to correctness in dates, as it is only necessary to move the type ahead one date each day.

The recording of junction symbol and date upon car lists would prevent any wholesale transferring of cards. Even if a few such cases should occur the consequent loss and annoyance would be less expensive and troublesome than the writing in of thousands of initials and numbers daily. Again, the more simply and easily the work can be done the fewer failures under adverse conditions.

Making all agents and yard masters strictly accountable for the proper carding of cars, and responsible for all cars remaining upon the road more than 30 days, unless the detention was beyond their control and they had so notified the proper official, will get the cars home, or in position to receive proper attention, before penalties can accrue.

This plan is not designed to take the place of, or interfere with, the efforts to dispose of cars upon which the car accountant has penalty notices; nor does it affect the practice of card-billing of per diem cars, either before or after they have become penalized.

GENERAL NEWS SECTION

THE SCRAP HEAP.

The Indiana Shippers' Association has renewed its agitation for the passage of a law creating in that state a railroad commission.

Eighty-five and six-tenths per cent. of the freight cars of the country now have air brakes, according to the last report of the American Railway Association.

A press despatch from Baltimore says that the Pennsylvania Railroad has bought lands for planting trees (for sleepers) in Maryland, Delaware and Pennsylvania. A large tract has lately been bought in Pennsylvania near the Maryland line.

The Supreme Court of North Carolina has decided the case of the North Carolina Corporation Commission against the Atlantic Coast Line, involving the power of the commission to require the road to make connection with the Southern at Selma by putting on an additional train. The Superior Court decided against the commission. The Supreme Court reverses this position and holds that the commission has full power to compel railroads, as public highways, to make connections with other lines, even if an extra train has to be put on to do this.

The Chicago & Alton carried 1,000,000 passengers to the World's Fair, an average of 2,270 a day, but had no accident, and not a traveler was killed or injured.

The statement is published that during the season of the St. Louis Exposition, which began June 1 and ended Dec. 1, the Cleveland, Cincinnati, Chicago & St. Louis moved each way daily on regular schedules 24 trains over the St. Louis Division, most of them fast trains and carrying through passengers. In addition to this the road had freights swelling the number to 32 a day in each direction, and these trains were handled without an accident of any serious character. Not a passenger or employee was killed during the period. In addition to this there were frequent special trains and on portions of the division gravel trains were steadily at work.

Division superintendents of the Southwest System of the Pennsylvania Lines West of Pittsburg are in receipt of congratulatory letters concerning the admirable manner in which traffic was handled during the time of the St. Louis World's Fair. The letters are from General Superintendent Ralph Peters. In spite of the extraordinary regular traffic, and the unusual number of special trains all were handled without accident. Traffic was heavier than that to the Chicago fair in 1893 on account of 1904 having been a better year for general business and because the traffic to St. Louis was almost exclusively over the southwest system, while that to Chicago was divided between the Fort Wayne and the Panhandle.

Justice Dickey, in the Supreme Court of New York, last week, in a suit for damages against the Brooklyn Heights Railroad Company, brought by a passenger who was kicked by another passenger when the latter climbed into a car through a window, held that the railroad company was in some measure answerable, on the ground that its station men should have prevented the lawless passenger from thus entering the car. The injury occurred at an elevated station in Brooklyn. A crowd of people returning from Coney Island made such an eager rush for seats in the cars that some of the men climbed in through windows, and the innocent passenger, sitting inside, had his nose broken. The argument of the company before the court was that its agents were powerless to prevent the window climbing. On this argument the jury decided for the road, but the judge set the verdict aside, on the ground that the same thing had occurred before, and often enough to give the company warning that it was in duty required to keep a larger or better force of attendants at the station to maintain order.

B. & O. Office Building.

The Baltimore & Ohio has established a mixed competition for the purpose of selecting an architect for its proposed new office building at the northwest corner of Baltimore and Charles streets, Baltimore. A committee, consisting of the President, three Vice-Presidents and Chief Engineer, with Prof. William R. Ware as its adviser, will make the award, and six firms of architects have been selected, who will be paid for drawing designs for the building to be submitted in the competition, but about 25 others will have an opportunity to offer plans.

The general plan of the building provides for a structure of 155 by 168 ft. and 13 stories high. Each floor will have approximately 13,500 sq. ft. of surface, making a building with a total floor space of nearly four acres.

The offices will be provided with all the latest improvements in modern office buildings, and it is the intention of the company to build a structure that will provide for its necessities for many years to come.

It is expected that the Committee on Award will begin its work about January 12th.

A Yale Tribute to Mr. McClung.

The following notice of T. L. McClung, who recently resigned as Assistant Freight Traffic Manager of the Southern to become Treasurer of Yale University, is taken from the *Yale Alumni Weekly*:

Thomas Lee McClung, whose appointment as University treasurer, has already been announced, in one sense does not need an introduction to the Yale public or to the general public. In undergraduate days his name was frequent enough in college talk and writing, and was carried everywhere outside where the news of athletic triumphs traveled. The general public knew him as a Yale athlete of unusual ability, and from what they knew of him on the field and from what they could learn of him, thought him decidedly the right kind of a man to represent the University in any public way. The men of his college generation knew him quite as much as a man who stood strongly for all the good things of college life.

The substantial popularity which he enjoyed as an undergraduate, and has since held in the Yale world, rested on force of character, and in a straightforward honest manner. And since graduation, in his work in the world, he has by no means hidden his candle under a bushel. After selecting railroading he gave himself to it with such characteristic single-mindedness and energy and good sense that, when he was called to the University treasurership, he had already gone a long ways on the upward climb. He began this work in 1894 with the St. Paul & Duluth Railroad, and in 1896 was made its paymaster. Accepting a position in 1898 with the Southern Railway he was, in 1901, made assistant to the second vice-president. In the next year he was made assistant freight traffic manager of the system and he recently had been put in charge of that department of the company's traffic west of the Alleghenies. A record of this sort makes it almost superfluous to add that his former associates speak in the highest terms of his administrative ability, that experienced railroad men had already marked him as one of the best of the younger men in railroad work, and as destined in the not distant future for positions of the highest responsibility. It is probably also unnecessary to add after this statement, that his acceptance of Yale's offer was dictated by considerations that seemed to him much more important than a question of salary.

At the same time, the appointment of Mr. McClung is a distinct departure from tradition, and for this reason a good many questions have been asked about it. The new treasurer's work has not been distinctly along financial lines, nor has his training had much to do with the question of investment values. In choosing him the Yale Corporation has distinctly declared the treasurer's office to have become first of all an executive office, having to do with the handling of a large and diverse plant.

New Erie and W. T. Steamer.

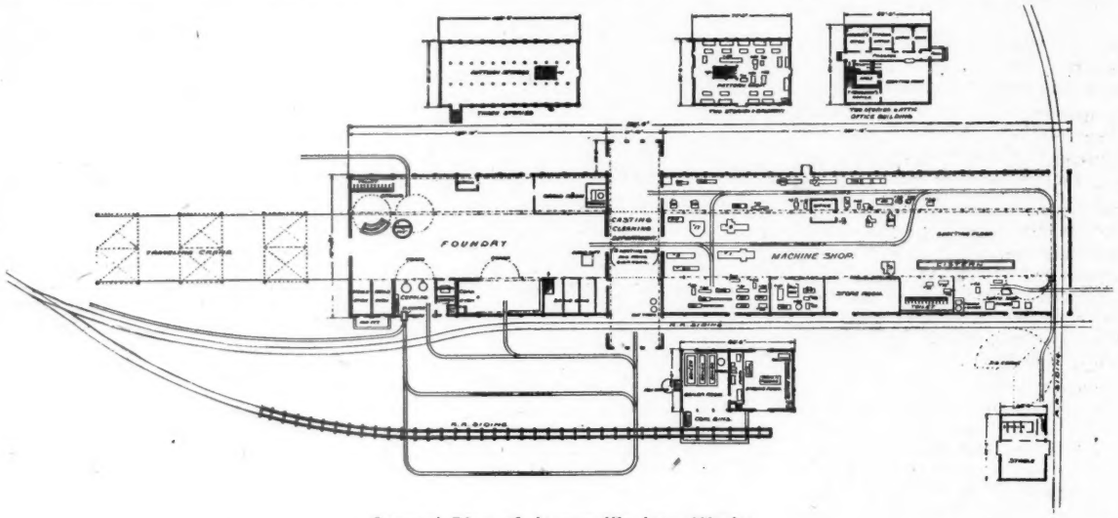
The Erie & Western Transportation Company has ordered from the Great Lakes Engineering Works, of Detroit, a freight steamboat to be added to the company's large fleet now operating on the Great Lakes. It is to be a 5,000-ton steel vessel, 350 ft. long and 40 ft. wide. The contract calls for its completion on Oct. 15, 1905. The company also announces that the Juniata, a passenger and freight vessel being built by the American Shipbuilding Company, at Cleveland, will be launched on December 17. This vessel will be a sister ship of the Tionesta, now in service, and will have a freight capacity of 3,500 tons and accommodations for 200 passengers. It will be 366 ft. long and 50 ft. wide.

Comity Between C. T. and M. W.

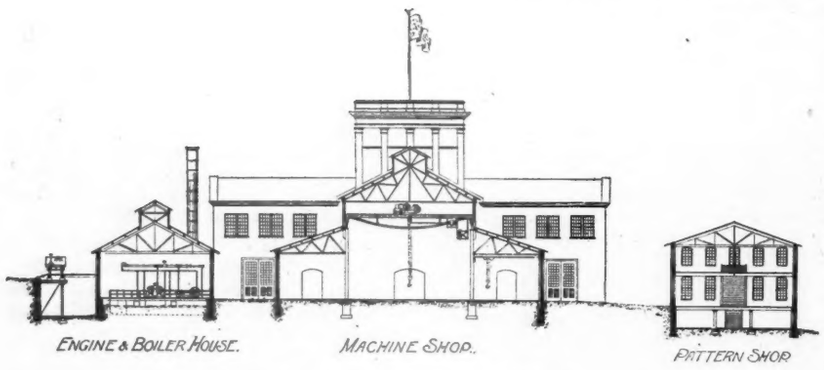
A dinner given to a railroad officer in Chicago Saturday evening was somewhat unusual, in that it was given for the purpose of showing the friendliness of one department to another—a function which is supposed usually to require only negative terms for its expression. Mr. C. S. Hall, engineer in charge of track elevation on the Chicago and North Western, was entertained by the division and terminal operating officers and the yardmasters. Mr. Hall has never been in the operating department; but during the last five years he has superintended the elevation of more than five miles of North Western main track, and nearly twenty miles, including sidings and yards, the work necessitating the construction of a large number of viaducts. This extensive and delicate work was so performed that the delay to the passenger and freight traffic of the road was kept at the minimum, a fact to which the operating officers deemed it fitting to testify in this graceful manner.

The New Plant of the Jeanesville Iron Works Company.

The general layout of the new plant of the Jeanesville Iron Works Company, maker of mine pumps, at Hazleton, Pa., is shown in the accompanying illustration. Dodge & Day, modernizing engineers, of Philadelphia, had charge of the equipment, and Ballinger & Perrat, architects, received the contracts for the buildings, which are principally of reinforced concrete construction.



General Plan of Jeanesville Iron Works.



Cross-Section Jeanesville Iron Works.

The new plant consists of six buildings. The main building comprises the foundry, 107 ft. x 192 ft.; the casting cleaning department, 41 ft. x 160 ft., and the machine and erecting shop, 304 ft. x 107 ft. In the latter are located a room for small stores and a blacksmith shop. The other five buildings are the pattern shop, the pattern storage house, the offices, the power house and a stable.

The casting cleaning department is separated from the foundry and machine shop by two fire walls extending above the roof. As a precaution against fire the entire side of the pattern storage building facing the foundry is a solid wall without windows. The cross section drawing of the plant shows the machine shop, engine and boiler house, the pattern shop, coal trestle, and, in the background, a side view of the casting cleaning department with the fire walls extending above the roof forming a tower in which are the water tanks and the heating apparatus.

With the exception of several pneumatic, ground-operated traveling cranes in the casting cleaning department, all of the machinery in the shops is driven electrically, direct current being used. A 300 h.p. De Laval turbine, connected to two 100 k.w. Crocker-Wheeler generators furnishes power for the entire plant. Multiple voltage for obtaining the desired speed regulation throughout the shops is obtained by the introduction of a type D Crocker-Wheeler balancer set, consisting of three units, 40, 80 and 120 volts, each of these voltages being controlled by three field regulators.

A 12 in. x 18 in. x 12 in. x 12 in. Ingersoll-Sergeant Class H air compressor supplies air to the traveling cranes in the casting cleaning department, jib cranes in the foundry, and the pneumatic tools. Between the engine and the boiler rooms is an artesian well pump, the boiler feed pump, the vacuum pump, the feed-water heater and a 1,000-gallon underwriter's fire pump, which receives its supply from a 200,000-gallon reservoir. Fire plugs and hose lines are placed about the premises.

The clinkers from the boilers are thrown on a grating over an elevator boot located in the boiler house and are broken to the proper size, dropped through the openings and into buckets of a steel-encased elevator, made by the Link-Belt Engineering Company, whence they are carried to a cylindrical receiving bin of 5-tons capacity. They are dumped into trucks through a gate in the bottom of the bin and carted away.

The pits in the foundry are served by individual jib cranes operated pneumatically. In the right hand bay of the foundry is a cupola, four core ovens, the blower room moulding department for small castings, and sand bins and sifters.

The cupola is of 12 to 14 tons melting capacity per hour, and another similar unit is now being installed. The charging platform is served by a 2-ton electrically driven elevator provided with automatic stops at the top and bottom of the lift. There are two worm ladles of 8,000 and 10,000 lbs. capacity respectively as well as a number of smaller ladles.

General View of Machine Shop.

Haberkorn Valves for Stationary Engines.

The Haberkorn Engine Company, Fort Wayne, Ind., in June of this year applied the Haberkorn valves and cylinder to a 24 in. x 30 in. Erie slide-valve engine at the plant of McCray, Morrison & Co., Kentland, Ind. The boiler plant consisted of two 150-h.p. boilers, and the daily fuel consumption amounted to 5 or 6 tons of the best grade of Pittsburg coal. A recent report from this concern states that there has been a notable saving in coal consumption since the change; that from 1½ to 2 tons of coal a day is sufficient to do the work, and a cheaper grade of coal is used. The report expresses the satisfaction of the company with the results of the

change. Another application for which figures are given was at the plant of S. F. Bowser & Co., Fort Wayne. Their power plant consisted of two internally-fired boilers, each fitted with a 48-in. Morrison corrugated furnace and a Jones under-feed stoker, with Coles automatic attachment; and two direct-connected power units of 75 k.w. and 40 k.w. respectively, furnishing current to motors of from 5 to 25 h.p. capacity. About a year ago the larger engine was fitted with a Haberkorn cylinder and valves, and the smaller engine was replaced by a new Haberkorn. A comparison of the fuel consumption before and since the change is given as follows: In daily runs of 17 hours before the change was made, from 5 to 6 tons of coal were consumed. Since the change, with the same hours and the same load, the average consumption has been reduced to 2½ to 3 tons a day, a saving of 50 per cent.

The L. C. Chase & Company's Exhibit at St. Louis.

In connection with the illustration, shown herewith, of the Sanford Mills (L. C. Chase & Co., Boston, Mass.) exhibit at the St. Louis Exposition, to whom was granted the Grand Prize for its mohair upholstery plushes, it would, perhaps, not be out of place to give a little history of the manufacture of mohair plushes. The raw material, or mohair, as it is designated, from which mohair plush is made, is produced from the hair of the Angora goat. These goats were first found in Smyrna, Turkey in Asia, and they were first introduced in America through the Agricultural Department, by Dr. Davis, in the year 1847, and from this date the goat industry in this country has steadily advanced. The best field for their propagation, and the section in which the best mohair has been produced, is the state of Oregon, but nearly all the states are now raising goats to a greater or less extent, although Oregon still leads in the production of the largest quantity and the finest qualities. The bulk of the mohair, however, is still produced in Turkey in Asia. Up to 1880 the manufacture of mohair plush was centered in France and Germany, England spinning the yarn, and shipping to both these countries. All the plush consumed in this country up to 1880 was made abroad. It is claimed that the Goodall Bros., of Sanford Mills, in 1880, were the first to attempt the manufacture of mohair plush in this country, and the first in the history of the world to produce mohair plush on power looms. The Goodall Bros. consolidated with Sanford Mills, and the product of the mill is known as the "Chase Goat Brand," and is sold by L. C. Chase & Co., of Boston, Mass. The first year after starting this industry in this country, the price of mohair plush was reduced at least 50 per cent. Mohair plush today is recognized by the railroads and car builders as a most substantial and durable fabric; the fibre is tenacious; it is elastic; its colors are fast and it can be dyed to any shade, and also can be easily renovated. The average life of the plush is from eight to twelve years.

An Exhibit of Mohair Upholstery and Plushes.

Delegates to the International Railway Congress.

The State Department at Washington has been informed of the following appointments of official delegates to the International Railway Congress by the governments named:

Argentine Republic—
Carlos Maschwitz, Engineer.
Luis Rapelli, Engineer.

Belgium—
E. Hubert, Administrator of the State Railways, member of the International Committee of the Railway Congress.
Gerard, Inspector General, having in charge the general inspection of the electric service of the State Railways.
L. Weissenbruch, Chief Engineer, Director in the Department of Railways. Secretary of the International Committee of the Railway Congress.

Bulgaria—
1. St. Sarafoff, Manager, represented by his assistant for the Traffic Department.
2. The heads of Departments, each according to his specialty.
The Head of the Maintenance Department.
The Head of the Transportation Department.
The Head of the Motive Power Department.

China—
Chan T'ien-yu, District Magistrate.
Kuang Ching-yang, District Magistrate.
The Taot'ai, K'o Hung-nien.
M. Jadot.

Denmark—
G. C. C. Ambt, General Director Danish State Railways.
One or two other delegates to be appointed later.

France—
Perouse, Councillor of State, Inspector General of Roads and Bridges, Director of Railways at the Ministry of Public Works.
Colson, Councillor of State, Engineer in Chief of Roads and Bridges, former Director of Railways at the Ministry of Public Works.
Lax, Inspector of General Roads and Bridges, former Director of Railways at the Ministry of Public Works.
Nivoit, Inspector General of Mines, Vice-President of the Committee for the Technical Working of Railways.
Beaume, Inspector General of Roads and Bridges, General Director of the Northern lines.
Pontzen, Member of the Committee for the Technical Operation of Railways.
Fontanellles, Chief Engineer of Roads and Bridges, Aid to the Director of Railways at the Ministry of Public Works.
Bernheim, Mining Engineer.
One additional delegate to be named later.

Greece—
P. Homere, Departmental Engineer.
Aristide Balanos, Civil Engineer.
N. Sideridis, Engineer.

Guatemala—
Joaquin Yela, Guatemalan Chargé d'Affairs in the United States.

Italy—
Commendatore Engineer Cesare Rota, General Inspector of Railways.
Cavallere Prof. Engineer Grismayer Egisto, Railway Inspector.

Mexico—
Santiago Mendez, Engineer.

New South Wales—
Charles Nicholson Jewel Oliver, J. P., Chief Commissioner of Railways.

Paraguay—
Diplomatic representative at Washington.

Peru—
Henry G. Davis, of West Virginia.

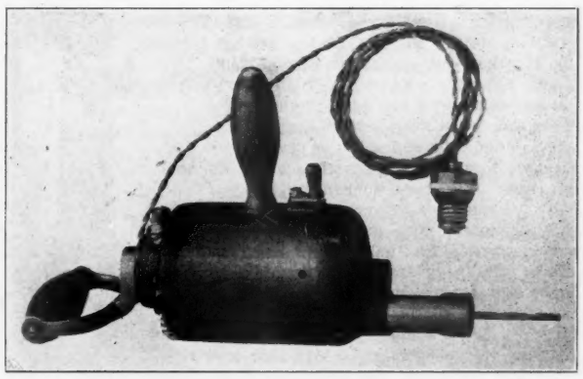
Roumania—
Inspector-General E. Miclescou, Director-General of the Government Railways.
Inspector-General M. M. Romniceanou, Sub-Director.
Inspector-General A. L. Cottescou, "Chef de Service."
Inspector-General Th. Dragou, "Chef de Service."
Inspector-General J. Baiulescou, "Chef de Service."
Ingenieur H. O. Schlawe, "Chef de Division."

Siam—
H. Gehrts, Director-General State Railways.

South African States—
Cape Government Railways, by Mr. McEwen, General Manager.
Central South African Railways, by Mr. Hoy, Chief Traffic Manager, and another official whose name will be furnished later.
Natal Government Railways, by Mr. Downie, Traffic Manager.

The Hisey Electrically-Driven Hand Drill.

The portable electrically-driven hand or breast drill shown in the accompanying illustration is made by the Hisey-Wolf Machine Company, Cincinnati, Ohio. This is a handy tool for small work and is designed to take the place of the old-style hand drill. The motors in these drills are wound for either 110 or 220 volts, direct current. A switch used for starting and stopping the drill is located near the vertical handle as shown. The switch can be easily shifted to the on or off position by the index finger. The chuck spindle is located to one side of the center, so as to allow drilling on a line with the base of the motor. This arrangement also permits of drilling in corners and angles. The motor is enclosed, and is provided with either one or two speed as desired. The No. K drill has a capacity for drilling holes up to ½ in. in diameter. The over-all dimensions of this drill, including chuck and handle, are 5½ in. x 16 in. It can be carried anywhere with ease, as it only weighs 27 lbs. The drills are furnished complete, ready for work with chuck, cord and attachments.



The Hisey Electrically-Driven Hand Drill.

Standardizing a Railroad.

With the absorption of railroads in the past few years, the process of welding into a new entity separate lines which have been merged has been a conspicuous feature of railroad operations. The first large system after the receivership period to be evolved was the Southern Railway in 1894. The last conspicuous example has been the Rock Island.

There are really two kinds of unification which we find; the one is a financial and traffic unification, and the other an operating unification. Up to a certain limit it is practicable to reduce the railroads to a single operating unity, but when they have reached a mileage of 5,000 or more, the mere difficulties of communication become so great as

to make too close concentration of control a disadvantage. Sometimes there is a compromise by the development of an east and west system, as in the case at one time of the Southern Railway and the Wabash.

The systems developed latterly have become so very large that it is deemed unwise to weld them into a single railroad. The problem has been to find that point where autonomy shall cease and consolidation begin. In the case of the Vanderbilt roads the affiliated properties for years have been operated separately—the only unity has been in the financial and traffic policies. Separate officials, different accounting methods, separate offices and equipment, and sometimes much local rivalry in traffic affairs have been deemed the parts of a wise policy. But latterly they have begun to unify the executive department and have extended the prerogative of an operating executive of the New York Central, to embrace some of the subordinate properties. But the most far-reaching consequences probably date from the appointment of a general superintendent of motive power to look after the general types of motors and rolling stock.

Mr. Harriman in unifying his lines has appointed a director of traffic, a director of purchases and a director of maintenance and operations. Incidental to the appointment to the office of director of purchases, for 18,000 miles there has been worked out a system of standards for all classes of supplies and for details of rolling stock. The process has gone so far that the locomotive and cars of the system are reduced to standard in every detail. The placing of an order by the director of purchases becomes a very simple matter. The standards which he employs are certain definite quantities, exactly defined in specifications. They are worked out by conference of the motive power officials of the different systems; are printed and blueprinted, and ready for instant use.

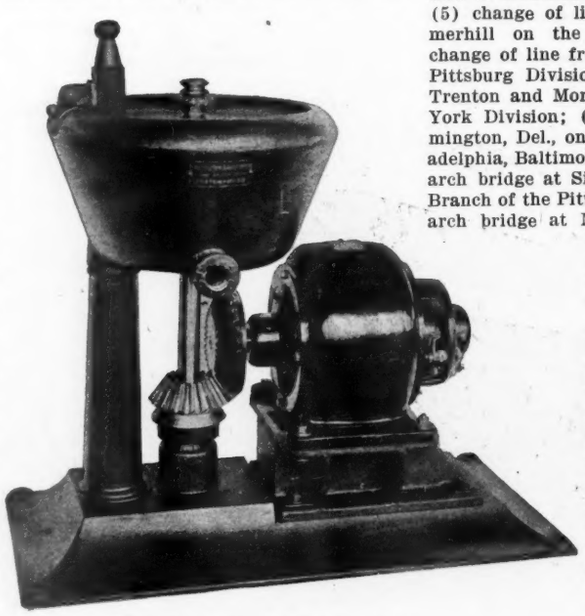
There is something fascinating in general standards and general regulations, but they can easily be pushed too far. A standard or regulation is but a generalization as to conditions that are to be met. While they are desirable and necessary, yet they should always be used with a clear notion of the limitations imposed upon them. The standardizing of materials and supplies tends to take away from the manufacturer the incentive to better or cheapen his product. The same principle runs throughout everything to which the standard may be applied. It is a nice adjustment when the standards leave sufficient flexibility for the constant test of new methods and different materials and adaptation to special conditions. On the other hand, it is clear that the railroads may go further than they have with much success. A system like Mr. Harriman's system of 18,000 miles can realize economy in the extensive use of standards which give interchangeability, and enable the purchasing department to make enormous contracts. But, on the other hand, the railroads have suffered much in the past by the inflexibility of standards which do not apply. Almost every road of any size will have three distinct types of conditions to deal with, the main line, the main branch line, and the spur line. The types of efficiency to meet these conditions are so different that, except in certain very general characteristics, their difference is not one of degrees but of kind. —*Wall Street Journal.*

New Steamers for the Panama Railroad Company.

The Panama Railroad Co., it is reported, has asked for plans and bids for building two or three new steamers of 4,000 or 5,000 tons burden with accommodation for 400 or 500 first class passengers, to cost between $700,000 and $800,000 each.

Electrically Driven Centrifugal Oil Separator.

The centrifugal oil separator shown in the accompanying illustration is made by the American Tool & Machine Company, Boston, Mass. The turnings, chips, etc., from which oil is to be extracted are placed in a moveable metal pan. This pan has sloping sides and a bronze sleeve which surrounds the spindle to prevent the oil from leaking out. It is fitted into a similarly shaped casting and securely fastened to the spindle. A circular top is screwed over the pan containing the oil soaked scrap to within about $^1/_{16}$ in. of its brim. When the machine is started the inner pan revolves with the spindle and the centrifugal force drives the oil up the sloping sides of the pan and out through the opening between the pan brim and lid. The



Centrifugal Oil Separator.

oil then falls on the inside of the outer casting and drains off through an outlet, which is shown in the illustration.

It takes from five to eight minutes to separate the oil from 750 cu. in. of material. The machine shown is driven by a one h.p. form "L" motor made by the Crocker-Wheeler Company of Ampere, N. J. The motor runs at a speed of 1,250 r.p.m. and drives the spindle of the separator, through a bevel gear at 1,800 r.p.m. It is claimed that this machine, in the average machine shop, will pay for itself in less than a year.

Official Awards to the Pennsylvania at St. Louis.

The following awards were made to the Pennsylvania Railroad System by the juries of the Louisiana Purchase Exposition:

(1.) A special commemorative grand prize for its original series of scientific investigations of locomotive performance conducted at the Louisiana Purchase Exposition, the methods and results of which are a permanent contribution to the advancement of engineering knowledge. The committee of five, composing the superior jury, "was unanimous in this action, and each member individually expressed his high appreciation of the magnificent work done by the Pennsylvania Railroad System in establishing and conducting this testing plant."

(2.) In the Department of Liberal Arts, group 26: A grand prize for the model of the terminal passenger station in New York City.

(3.) In the Department of Transportation Exhibits, group 74: A grand prize (*a*) the locomotive testing plant and laboratory; a grand prize (*b*) the railroad postal and mail car; a grand prize (*c*) the model of the West Philadelphia terminal; a grand prize (*d*) the model of the New York and Long Island railroad tunnels; a grand prize (*e*) full size section of tunnel under the North River; a grand prize (*f*) exhibit of maps and drawings illustrating the following improvements made on the Pennsylvania Railroad, viz.: (1) Change of line at Irwin, Pa., on the Pittsburg Division; (2) Brilliant Branch of the Pennsylvania Railroad through the city of Pittsburg; (3) change of line at Coatesville, Pa., and stone arch bridge over the Brandywine Creek on the Philadelphia Division; (4) change of line east of Duncannon on the Middle Division; (5) change of line from Wilmore to Summerhill on the Pittsburg Division; (6) change of line from Lilly to Portage on the Pittsburg Division; (7) change of line at Trenton and Morrisville, N. J., on the New York Division; (8) track elevation at Wilmington, Del., on the main line of the Philadelphia, Baltimore & Washington; (9) stone arch bridge at Silver Lake on the Brilliant Branch of the Pittsburg Division; (10) stone arch bridge at New Brunswick, N. J., on the New York Division; (11) Rockville bridge over the Susquehanna river on the Middle Division.

(4.) A grand prize to the Société Alsacienne de Constructions Mécaniques for the De Glehn four-cylinder balanced compound locomotive.

(5.) A commemorative gold medal to the Pennsylvania Railroad System in connection with the exhibit of the De Glehn four-cylinder balanced compound locomotive.

(6.) In the Department of Social Economy, group No. 138: A gold medal for the exhibit of the pension, relief and saving fund departments of the Pennsylvania Railroad and the Pennsylvania Lines West of Pittsburg; a gold medal for the exhibit of the Pennsylvania Railroad, Philadelphia branch, Y. M. C. A.

The most important of these awards is the first. This award is unique and special, and as such may be regarded as the highest official award made by the exposition. It is not for an *exhibit*, but is a special recognition of the liberality and progressiveness of the Pennsylvania Railroad System in making, at its own great cost, investigations of the highest scientific value, "the methods and results of which are a permanent contribution to the advancement of engineering knowledge." The Pennsylvania Railroad System chose an Advisory Committee of international character to aid in conducting the investigations and selected for test, locomotives of foreign as well as of home make in order that the investigations should be made upon broad lines and under the best conditions to produce useful and authoritative results.

(7.) Gold medals were also awarded to each of the collaborators in connection with the preparation of the exhibits and the testing plant, as follows: J. J. Turner, Third Vice-President, Pennsylvania Lines West of Pittsburg; Theo. N. Ely, Chief of Motive Power, Pennsylvania Railroad System; F. D. Casanave, Special Agent, Pennsylvania Railroad System; A. W. Gibbs, General Superin-

dent of Motive Power, Pennsylvania Railroad Company; E. D. Nelson, Engineer of Tests, Pennsylvania Railroad Company; A. S. Vogt, Mechanical Engineer, Pennsylvania Railroad Company; G. L. Wall, Director of Tests, Pennsylvania Railroad System; Willard A. Smith, Chief of Department of Transportation Exhibits; W. F. M. Goss, Dean of Schools of Engineering, Purdue University, LaFayette, Ind.; Edwin M. Herr, General Manager, Westinghouse Air-Brake Company; J. E. Sague, Mechanical Engineer, American Locomotive Company; F. H. Clark, Superintendent of Motive Power, C., B. & Q.; C. H. Quereau, Superintendent of Shops, New York Central; F. M. Whyte, General Mechanical Engineer, Vanderbilt Lines; H. H. Vaughan, Superintendent of Motive Power, Canadian Pacific; H. V. Wille, Engineer of Tests, Baldwin Locomotive Works; John A. F. Aspinall, General Manager, Lancashire & Yorkshire, England; Karl Steinbiss, Director, Royal Prussian Railways, Altona, Germany; Chas. M. Jacobs, Chief Engineer, North River Division, Pennsylvania, New York & Long Island Railroad Company; McKim, Mead & White, architects, New York terminal station; Klee Brothers, makers of model of New York terminal station; Victor Mindeleff, maker of models of West Philadelphia terminal and New York and Long Island tunnels.

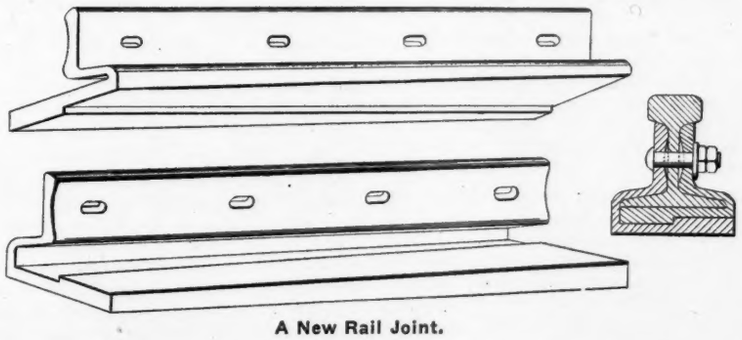
All-Electric Interlocking.

The General Railway Signal Company, Buffalo, N. Y., reports the receipt during the past 60 days of orders for all-electric interlocking plants at 20 places aggregating 1,212 levers or spaces. The names of the places are shown in the accompanying double-column table.

	Road.	Machine spaces.
Pana, Ill.	Cleveland, Cincinnati, Chicago & St. Louis...	112
Lawrenceburg Junction, Ind.	Cleveland, Cincinnati, Chicago & St. Louis...	28
Broad Street, Columbus, Ohio	Toledo & Ohio Central	72
Wilders, Ind.	Erie	32
Fourth Street, Saginaw, Mich.	Pere Marquette	64
Washington Avenue, Saginaw, Mich.	Pere Marquette	44
Kedzie Avenue, Chicago, Ill.	Chicago & Northwestern	104
Ashtabula, O.	Lake Shore & Michigan Southern	112
Morton Grove, Ill.	Chicago, Milwaukee & St. Paul	40
Ashmore, Ill.	Cleveland, Cincinnati, Chicago & St. Louis...	12
Atlanta Terminal, Ga.	Atlanta Terminal Co.	184
West Columbus, Ohio	Baltimore & Ohio	56
Eldorado, Kan.	Atchison, Topeka & Santa Fe	24
Bellaire, Ohio	Baltimore & Ohio.	28
Erie, Pa.	Lake Shore & Michigan Southern	64
East Toledo, Ohio	Lake Shore & Michigan Southern	100
Hinton, W. Va.	Chesapeake & Ohio	12
Harriman Junction, Tenn.	Cincinnati, New Orleans & Texas Pacific....	20
Champaign, Ill.	Illinois Central	32
Centerville, Ill.	St. Louis Merchants' Bridge	72
Total		1,212

A New Rail Joint.

A new design of rail joint which has recently been patented is shown in the accompanying drawing reproduced from the patent papers. The joint is formed of two parts,



A New Rail Joint.

the novel feature being the base. The bottom of each member of the joint is thicker at one end than at the other, the tapers of the two being respectively in opposite directions. The halves also interlock on the bottom. Movement of the plates longitudinally and oppositely causes them to firmly clamp the base and web of the rail, final movement and adjustment being provided for by slotted bolt holes. When the joint members are thus forcibly moved to the limit of their travel, by the blows of a sledge for instance, the effect is to encase the rail ends in a box-like structure and hold them rigidly against vertical or lateral movement. The joint may be tightened at any time with a few blows of a hammer. The patentees are Messrs. Y. and J. G. Ardandez and C. L. Voorhies, of New Iberia, La.

Forty Years in Transportation.

It is impossible to overestimate the results accomplished by American railroads in reducing transportation costs to shippers in the last 20 years, especially in the charges for carrying freight. During that period no other country has had the advantage of such low rates as have been made by American lines.

The London *Statist* recently remarked that in England "the average rate per ton per mile has never shown any reduction worth speaking of since railroads were introduced, and in spite of the growing density of traffic in England the cost of operation, both actually and relatively to the traffic, rose steadily until an effort to stop the advance began to be made in 1900." In this country not only have freight rates been reduced sharply but the railroads, chiefly by a large expenditure of money, have been able to so reduce the cost of operation as to make a profit on the low rates which have been established.

The result on the Pennsylvania Railroad, which has been foremost in the work of perfecting its line and equipment and in expending money in order that the costs of operation might be reduced, has been such as to make a summary of what has been done during the last 40 years an interesting record of railroad history. The tables give the tons of freight carried one mile, the average rate per ton per mile and the freight earnings at different periods since 1864.

These figures do not show the lowest point reached for the average rate per ton per mile which was in 1899. It will be seen that the rate since 1864 has fallen from 2.498 cents to .585 cent in 1894 and .605 cent in 1903. If the Pennsylvania Railroad, which has still the legal right to charge 3 cents per ton per mile in this State, had maintained the rate in force in 1864, as the English roads have, the earnings from freight alone in 1904 would have been more than $370,000,000 and would have been sufficient to have provided for a dividend in that year of 100 per cent. on the present outstanding stock issue and to have provided handsomely for extraordinary expenditures. The earnings from freight during this period have increased from $10,907,036 to $89,895,722 and the rate per ton per mile has fallen nearly 2 cents. The progressive movement between these two extremes is shown in the tables in a very striking way for each period. The difference between the freight business of the road now and 40 years ago is further made apparent in the following table:

	1874.	1864.	Inc. or dec.
Tons of freight carried 1 mile	1,916,591,690	436,591,940	Inc. 1,479,989,750
Average rate per ton per mile, cts.	1.290	2.498	Dec. 1.208
Freight earnings	$24,715,418	$10,907,036	Inc. $13,808,382
	1884.	1874.	
Tons of freight carried 1 mile	4,134,657,237	1,916,591,690	Inc. 2,218,065,547
Average rate per ton per mile, cts.	0.804	1.290	Dec. 0.486
Freight earnings	$33,242,301	$24,715,418	Inc. $8.526,883
	1894.	1884.	
Tons of freight carried 1 mile	6,902,828,482	4,134,657,237	Inc. 2,768,171,545
Average rate per ton per mile, cts.	0.585	0.804	Dec. 0.219
Freight earnings	$40,412,551	$33,242,301	Inc. $7,170,250
	1903.	1894.	
Tons of freight carried 1 miles	14,846,639,121	6,902,828,432	Inc. 7,943,810,639
Average rate per ton per mile, cts.	0.605	0.585	Inc. 0.020
Freight earnings	$89,895,722	$40,412,551	Inc. $49,483,171

	Tons freight carried 1 mile.	Av. rate per ton per mile, cts.	Freight earnings.
1903	14,846,639,121	0.605	$89,895,722
1864	436,591,940	2.498	10,907,036
Change	14,410,047,181	1.893†	$78,988,686

†Decrease; all others increase.

The freight traffic on the Pennsylvania has increased more than 3,300 per cent., and the earnings from freight have increased more than 724 per cent., while the freight rate has fallen 75 per cent. In other words, the freight rate in 1903 is less than one quarter of that charged in 1864.—*Wall Street Journal.*

A Bas the Red Petticoat.

[Not from the *Ladies' Home Journal.*]

The red petticoat has been relegated to its own proper and unobtrusive function, we are happy to report; and modest maidens who flag trains now use red tablecloths. This is the latest fashion, as reported from Paris (Kentucky). Whether or not red tablecloths would be tolerated in the stuffy and excited dining rooms of the Waldorf we do not know—nor do we care; but they are a deuced handy thing to have in farm houses near high wooden trestles. In the free air of the South the "simple life" still counts a few faithful devotees and the laundry is not vexed with table cloths three times a day. Simplicity conduces to heroism, as witness the following report:

"Paris, Ky., Nov. 30, 1904.—Passengers on the Chesapeake & Ohio westbound flyer for Louisville were saved possibly from death last night by the heroism of Miss Lena Allen, 16 years old, who lives near Ewing-

ton, a few miles from here. Miss Allen discovered that a trestle which spanned a deep ravine near her home was on fire. She knew the flyer was due, and, tearing a red tablecloth from a table she ran down the track and flagged the train. The engine driver stopped just before reaching the trestle. With the assistance of the passengers the fire was extinguished. Miss Allen returned home as soon as the train stopped, but a delegation of passengers followed her to her house and expressed their thanks and assured her she would be rewarded."

Barring a few slight exaggerations, the story is true.

Manufacturing and Business.

Bids are being asked for rebuilding the Chicago Car & Locomotive Co.'s works at Hegewisch, Ill., which were damaged by fire October 9.

W. J. Sands has been appointed manager of the Allis-Chalmers Company's pumping machinery department, with headquarters in Milwaukee, Wis.

The Duff Manufacturing Co., Allegheny, Pa., announces that it has been awarded a gold medal at the Louisiana Purchase Exposition, for its Barrett lifting, track and car jacks.

The Neafie & Levy Ship & Engine Building Co., of Philadedphia, is now in the hands of a receiver, the company having been unable to secure enough working capital to carry out some of its large contracts, including government work, which are under construction at its shops.

Sumner J. Collins, for many years connected with the C. M. & St. P. R. R., and later with the Wisconsin Central and the Southern, will become associated with the Railway Appliances Company, Chicago, on January 1. Mr. Collins will give his time especially to the Q & C-Bonzano rail joint.

The resignation of P. F. Kobbe as Third Vice-President of the Westinghouse Electric & Manufacturing Co. has been announced. Mr. Kobbe retires on account of ill health, but remains a director of the company, and will be succeeded by L. A. Osborne, who has been Fourth Vice-President; Newton Carlton has been appointed Fourth Vice-President.

The Nashville (Tenn.) Bridge Co. has been incorporated with a capital of $150,000, succeeding the Nashville Bridge & Construction Co., to build a bridge at Nashville over the Cumberland River at the foot of Broad street, and to do other bridge work. The incorporators are: A. J. Dyer, A. B. Rowen, H. W. Buttorff, E. T. Lewis and J. A. Howe.

The Grand Trunk has closed a contract with the Safety Car Heating & Lighting Company for Pintsch gas lighting equipment for 1,200 of its cars and the installation of a number of Pintsch gas generating plants at different points on the company's lines to supply the cars equipped. At the present time only about 100 cars on the Grand Trunk have Pintsch light.

The Bethlehem Steel Corporation, successor to the United States Ship Building Co., has been granted incorporation in New Jersey with a capital of $30,000,000; $15,000,000 of preferred stock and $15,000,000 of common. The incorporators are: George R. Sheldon, Charles S. Fairchild, John E. Borne, Pliny Fisk, Max Nathan and Charles W. Wetmore.

The Archbold-Brady Co., of Syracuse, N. Y., local reports state, has been given a contract by the Lehigh Valley at $50,000 for structural steel and electrical work for the railroad's new shops at Sayre, Pa. The same company, it is reported, has been given a contract by the Rochester Railroad Co. at $10,000 for the steel to be used in building its new car barns in East Main street.

The Stow Flexible Shaft Company, Philadelphia, Pa., states that among the many orders it received during the past month were the following: A Halsey portable drill for a firm in Vancouver, B. C.; an 18 ft. flexible shaft, and a large crank pin turning machine from its St. Louis agent, together with three complete electric hammer outfits, shipped to Italy for use in the Government navy yards.

Chas. H. Tucker, hitherto Designer and Assistant Chief Engineer for Pawling & Harnischfeger, Milwaukee, Wis., has accepted the position of Chief Engineer of the Case Manufacturing Company, Columbus, Oho, engineers, designers and builders of cranes and special machinery. Mr. Tucker has been associated with the crane business since its infancy and is well known as an able engineer in this field.

The D. D. Slaight Lock & Manufacturing Co., successor to the Thomas Slaight Lock & Manufacturing Co., which for the last 50 or 60 years has made railroad switch and car locks and padlocks for other railroad purposes, as well as coach locks, caboose locks, saloon locks, cord guides and other car hardware, has sold its entire business, including patterns, tools, merchandise, patent trade marks and good will to S. R. Slaymaker, of Lancaster, Pa. S. R. Slaymaker will continue making the above line of goods and all unfilled orders now with the Slaight Co. will be completed and filled by him.

Iron and Steel.

The Old Dominion Iron & Nail Works, at Richmond, Va., it is reported, has passed into the control of Frank J. Gould. The works will make railroad material. Improvements are to be put in.

According to reports from Cleveland, the Cincinnati, Hamilton & Dayton was recently asking bids for a large amount of steel to be used in strengthening bridges on its line between Cincinnati and Toledo and between Cincinnati and Indianapolis.

At a recent meeting in Cleveland of the Bessemer Pig Iron Association, it was decided to continue the association for one year from January 1. The operations for the present year have been entirely satisfactory to the members, and they re-elected J. G. Butler, Jr., President.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

St. Louis Railway Club.

At the meeting of this club December 9, a paper by H. J. Pfeifer on "Teaming Yards" was presented, and there was a discussion by S. D. Webster of the paper on "Claim Agents and Claims" presented at the September meeting.

Engineers' Society of Western New York.

At the meeting in Buffalo December 6, the election of officers resulted as follows: President, George H. Norton; Vice-President, Horace P. Chamberlain; Secretary, Harry B. Alverson; Treasurer, Frank N. Speyer; Director, Alfred T. Thorn, and Librarian, William A. Haven.

Engineers' Club of Philadelphia.

At the meeting December 17 the nominations for officers for 1905 will be made; and the papers to be presented include the following: "A Note on the Summation of Stresses in Certain Structures," with illustrations by Carl Hering; also a paper on "Notes on the Stress in Wooden Stave Pipes," by Silas G. Comfort.

Western Railway Club.

At the November meeting of the club the matter of changing the hour of meeting from afternoon to evening was discussed, and upon motion was submitted to the members for a letter ballot. The result was almost a unanimous vote for the evening meeting, and the December meeting will therefore be held at 7:30 p.m., Tuesday, the 20th inst., in the Auditorium Hotel. The papers to be presented are "Cylinder Clearance and Valve Events," by O. W. Young, whose new design of locomotive valves and gear in use on the Chicago and North Western was described in *The Railroad Gazette* Nov. 4; and "American and British Reports on Railway Accidents," by Slason Thompson, Manager Railway News Bureau, Chicago.

Traveling Engineers' Association.

Following are the subjects to be discussed at the next annual meeting for committee reports:

1. Is the third man necessary on the large type of modern locomotives? If so, in what capacity? W. J. Crandall, N. Y. C. & H. R., Chairman.

2. Grease as a lubricant for all bearings on a locomotive. J. A. Talty, D., L. & W., Chairman.

3. What Devices for and Arrangement of Engines and Tenders Will Lighten the Work of the Engineer and Fireman? D. D. Kessler, D., L. & W., Chairman.

4. Bell Ringers, Air Sanders and Other Devices Operated by Compressed Air; Their Care and Arrangement to Get the Best Results. P. J. Langan, D., L. & W., Chairman.

Papers:

1. Electric Motors, and Instructing the Men to Handle Them. E. F. Miller, Chicago & S. S. Elevated.

2. Injectors; Modern Practice. S. L. Kneass, William Sellers' Mfg. Company.

3. The Latest Makes of Lubricators; Their Operation and Maintenance. C. G. Potter, L. E. & W.

4. The Mechanical Stoker. C. A. Kraft, C. & O.

5. The Piston versus The Slide Valve. W. J. McCarroll, Baldwin Locomotive Works.

Topical discussion: What system will enable the road foreman of engines to keep the best record of tire wear?

PERSONAL.

—Mr. John B. McDonald has resigned his position as a director of the Interborough Rapid Transit Company, New York, and it is said that he will no longer take part in the construction work of the company. On December 14, Mr. MacDonald was elected Vice-President and a director of the Metropolitan Securities Company, which controls the surface street railroads in Manhattan and The Bronx.

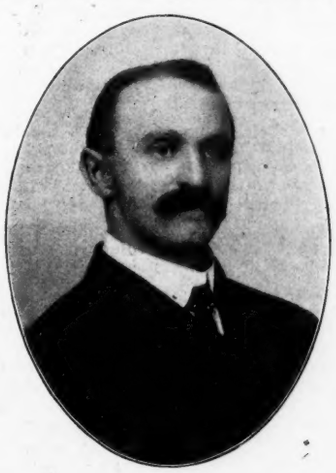
—Mrs. Lucinda B. Simmons, who died last week at East Orange, N. J., was the daughter of Wheat Beals, of Vermont, who built the first railroad in the United States—the three-mile strap-rail line at the Quincy granite quarries in Massachusetts. Her grandfather was a member of the Boston tea party.

—Mr. J. R. Groves, who has been appointed Superintendent of Motive Power and Car Department of the Denver & Rio Grande, succeeding F. Mertsheimer, resigned, began his railroad service on the Pennsylvania. In 1870 he went to Colorado, where he entered the service of the Kansas Pacific. He remained with this company until 1878, when he became Master Mechanic of the Denver

& Rio Grande. In 1880 he was appointed Superintendent of Machinery of the St. Louis & San Francisco, and on March 3, 1900, he became Superintendent of Machinery of the Colorado Midland. He has held this position until the present date.

—Mr. M. K. Barnum, formerly Superintendent of Motive Power of the Chicago, Rock Island & Pacific, has for some little time been engaged in mechanical expert work for the Burlington. This work has included the making of reports and recommendations concerning the shops, particularly with reference to the improvement of the equipment and mechanical practice. Another matter on which he has been engaged was the investigation of the piece-work system of the company, with recommendations relative thereto. He has also made reports with recommendations for quite extensive improvements at some of the main shops.

—Mr. Thomas B. Fogg, who was recently appointed General Manager of the Toledo Railway & Terminal Co., has, for the past twenty years, been identified with railroads west of the Mississippi. During this time



Mr. Fogg has held successively the positions of Station Clerk, Freight Agent Solicitor, Rate Clerk, Industrial and Immigration Agent and Chief Clerk in commercial freight office. For some time he was on the Atchison, Topeka & Santa Fe, but for seventeen years has been with the Missouri Pacific.

ELECTIONS AND APPOINTMENTS.

Chicago, Burlington & Quincy.—F. H. Ustick, Superintendent of Terminals at St. Louis, has been appointed Superintendent of the Brookfield division, succeeding P. H. Houlahan, resigned. Mr. Ustick will be succeeded by A. Hamilton.

A. W. Newton, who has been the Superintendent of Construction on the Old Monroe-Mexico cut-off, has been appointed Engineer of the Missouri District.

Cincinnati, Hamilton & Dayton.—S. B. Floeter, Division Superintendent at Lima, Ohio, and W. C. Shoemaker, Division Superintendent at Indianapolis, have resigned.

Consolidated Railway.—Calvert Townley has been appointed assistant to President Charles S. Mellen, with headquarters at New Haven. The Consolidated Railway Co. is the electric railroad organization of the N. Y., N. H. & H. For the present, Mr. Townley will act as substitute for E. H. McHenry, Fourth Vice-President of the N. Y., N. H. & H., who is ill.

Denver & Rio Grande.—J. R. Groves, formerly Superintendent of Machinery on the Colorado Midland, has been appointed Superintendent of Motive Power and Car Department, with headquarters at Denver, Colo., in place of Frederick Mertsheimer, resigned.

Great Northern.—J. H. Taylor, who recently resigned as Superintendent of the Erie, has been appointed Superintendent of the Superior and Missabe divisions of the Great Northern, with headquarters at Superior, Wis.

Lehigh & Hudson River.—At the annual meeting of this company, several directors representing various railroads which have an interest in the property were elected. The new directors are: W. H. Truesdale, President of the Delaware, Lackawanna & Western; F. D. Underwood, President of the Erie; E. B. Thomas, President of the Lehigh Valley, and S. M. Prevost, Third Vice-President of the Pennsylvania.

Louisiana Railway & Navigation Company.—H. B. Helm, Secretary and Auditor, has been appointed General Superintendent, succeeding J. A. Swigart, resigned. Mr. Helm will be succeeded as Auditor by John Tipien, Assistant Auditor.

Louisville & Nashville.—H. L. Stone has been appointed General Counsel, succeeding Charles N. Burch, who recently resigned to accept the position of General Solicitor for the Illinois Central.

New York Rapid Transit Commission.—It is stated that the Rapid Transit Commission has decided to accept the resignation of Chief Engineer William Barclay Parsons, and that Deputy Chief George S. Rice will be appointed as his successor.

Northern Pacific.—A. W. Wheatley has been appointed General Master Mechanic in charge of all lines east of Billings, Mont. W. S. Clarkson has been appointed General Master Mechanic of the Middle District between Billings and Spokane, and Wm. Moir has been made General Master Mechanic of the Western District, from Spokane to the Coast.

Pere Marquette.—John McManamy, formerly Road Foreman at Grand Rapids, Mich., has been appointed Assistant Master Mechanic in charge of shops, motive power and cars on the Buffalo division, with headquarters at St. Thomas, Ont.

St. Louis, Brownsville & Mexico.—W. J. Carnohan has been appointed Superintendent in charge of the First Division between Robstown, Tex., and Brownsville, including the Hidalgo and Corpus Christi branches.

Wabash.—H. J. Uhlenbrock has been appointed Assistant Master Mechanic at Decatur, Ill.

Western Pacific.—E. T. Jeffery, President of the Denver & Rio Grande, has been elected Vice-President of this company.

LOCOMOTIVE BUILDING.

The Richmond, Fredericksburg & Potomac is having two locomotives built at the Baldwin Locomotive Works.

The Chicago, Indianapolis & Louisville is having two locomotives built at the Brooks Works of the American Locomotive Co.

The Chicago Junction has ordered three simple six-wheel (0-6-0) switching locomotives from the American Locomotive Company for January delivery. The locomotives will weigh 110,000 lbs.; cylinders, 18 in. x 24 in.; diameter of drivers, 50 in.; straight top boiler, with a working steam pressure of 200 lbs.; heating surface, 1,274 sq. ft.; 200 National tubes, 2 in. in diameter and 11 ft. long; fire-box, $96^{3}/_{16}$ in. long and 33⅞ in. wide; tank capacity, 4,000 gallons of water, and coal capacity eight tons. Special equipment includes: Westinghouse-American brakes, Gollmar bell ringers, Franklin sectional magnesia boiler lagging, National-Hollow brake-beams, American Brake-Shoe & Foundry Co.'s brake-shoes, Gould couplers, Star headlights, Monitor injectors, Hayden piston rod and valve rod packings, Coale safety valves, Leach sanding devices, Nathan sight-feed lubricators, Ashton steam gages and Latrobe driving wheel tires.

The Union Terminal Railroad, of St. Joseph, Mo., has ordered one six-wheel switching (0-6-0) engine from the Davenport Locomotive Works; cylinders, 19 in. x 24 in.; weight on drivers, 120,000 lbs.; diameter of boiler, 62 in.; working steam pressure, 200 lbs. Special equipment includes: Westinghouse brakes, Leach sanding devices, Gollmar bell ringers, "Little Giant" pneumatic blow-off cocks, Crosby safety valves, Monitor injectors, Nathan sight-feed lubricators, Jerome metallic piston rod and valve rod packing and McConway & Torley couplers. The tender, which is to be built entirely of steel, will be equipped with Bettendorf steel bolsters and steel trucks.

CAR BUILDING.

The Wisconsin Central is building one passenger coach at its own shops.

The Illinois Central is building two passenger coaches at its own shops.

The Illinois Central is having 250 freight cars repaired by the Pullman Co.

The Maine Central has ordered 100 freight cars from the Standard Steel Car Co.

The Pennsylvania Lines West are reported to be figuring on 75 box and 25 coal cars.

The Central of New Jersey has ordered 500 box cars from the American Car & Foundry Co.

The Southern Pacific is reported to have ordered 10 passenger coaches from the Pullman Co.

The Denver, Northwestern & Pacific is reported in the market for three passenger coaches.

The Pabst Brewing Co. is reported to be contemplating the building of new refrigerator cars.

The Philadelphia & Reading has ordered 1,000 box cars of 60,000 lbs. capacity from the Standard Steel Car Co.

The San Pedro, Los Angeles & Salt Lake is reported to have ordered eight passenger coaches from the Pullman Co.

The Central Vermont has ordered 1,000 box cars of 60,000 lbs. capacity from the Mt. Vernon Car Manufacturing Co.

The Union Refrigerator Transit Company, Milwaukee, is having 200 cars repaired by the American Car & Foundry Co.

The Boston & Maine denies having ordered 300 tank cars from the Laconia Car Co., as reported in our issue of December 2.

The Soper Lumber Co., Chicago, has ordered 15 logging cars of 60,000 lbs. capacity from the American Car & Foundry Co., for immediate delivery.

The Illinois Central has ordered 450 Otis side dump cars from the National Coal Dump Car Co., Chicago. These cars will weigh 42,000 lbs., and measure 40 ft. long, over end sills; 10 ft. wide, over side sills; and 50 in. high, inside, to be built of wood and metal, with wooden underframes.

The Pittsburg & Lake Erie has ordered five 60-ft. baggage cars from the American Car & Foundry Co. for March, 1905, delivery. Special equipment includes: Carnegie axles, Commonwealth bolsters, Diamond special brake-beams, Westinghouse brakes, Janney-Buhoup couplers, Chicago Car Heating Co.'s heating system and Paige wheels.

The Pennsylvania Lines West have recently placed orders with the Cambria Steel Co., American Car & Foundry Co. and Standard Steel Car Co. for 2,025 standard class Gla all-steel hopper gondolas, 2,044 standard class Gsa all-steel long gondolas, and 1,000 standard class Gr gondola cars with steel underframes and wooden floors and sides.

The Quebec Central has ordered 50 box cars of 60,000 lbs. capacity from Rhodes Curry & Co., Amherst, N. S., for January, 1905, de-

livery. These cars will be 36 ft. long, 8 ft. wide and 8 ft. 6 in. high, all inside measurements. The special equipment includes: Simplex bolsters, National or Sterlingworth brake-beams, Westinghouse air-brakes, Tower couplers and Miner tandem draft rigging.

The Chicago & Eastern Illinois has ordered 200 National coal dump cars of 80,000 lbs. capacity from the Spencer Otis Company. These cars will be built by the American Car & Foundry Co., for Jan. 15, 1905, delivery. The cars will be 36 ft. long and 10 ft. wide, inside measurement; 8 ft. 6½ in. high from rail to top of sides. Special equipment includes: Chicago couplers and Republic draft rigging.

The Central of Georgia has ordered 500 ventilated box cars of 60,000 lbs. capacity from the South Atlantic Car Manufacturing Co. These cars will be 36 ft. long and 9 ft. ¾ in. wide. The special equipment includes: Simplex bolsters, Westinghouse air-brakes, Central of Georgia standard brasses, Tower couplers, Jones door fixtures, Butler tandem draft rigging, McCord journal box lids, Railway Steel-Spring Co.'s springs and Decatur wheels.

The Pittsburg Coal Co., Coraopolis, Pa., as reported in our issue of December 2, will build 200 coal cars of 80,000 lbs. capacity at its own shops, for January and February, 1905, delivery. These cars will weigh 32,500 lbs., and measure 35 ft. long, 10 ft. wide and 8 ft. 4 in. high. The special equipment includes: Bettendorf bolsters, Simplex brake-beams, Westinghouse air-brakes, National-Fulton brasses, Climax couplers, Miner draft rigging and McCord journal boxes.

The Seaboard Air Line expects to build 10 express and four first class coaches. All coaches will be 61 ft. long, over end sills; 9 ft. 8 in. wide, over side sills, and 14 ft. 2 in. high, over all. The special equipment for all will include: National-Hollow brake-beams, Westinghouse high speed air-brakes, Janney-Buhoup couplers, twin spring draft rigging and Safety heating system; Pintsch light, Standard Steel Co.'s platforms, and Pullman wide vestibules for first class coaches.

The Canadian Pacific expects to build as soon as possible 3,000 box cars of 60,000 lbs. capacity at its own shops. These cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements. The special equipment will include: Simplex bolsters and brake-beams, Westinghouse air-brakes, Tower couplers, Security doors, Miner draft riggings, Harrison dust guards, McCord journal boxes and lids, Chicago-Winslow improved roofs, and Simplex trucks, Barber roller side-bearings.

The Bessemer & Lake Erie has ordered 1,000 flat bottom steel gondola cars of 100,000 lbs. capacity from the Standard Steel Car Co. These cars will be 34 ft. long, 9 ft. 2 in. wide and 4 ft. 2 in. high, all inside measurements. The special equipment includes: Carnegie Steel Co.'s axles, Simplex bolsters, Waycott brake-beams, Lappin brake shoes, Westinghouse air-brakes and friction draft rigging, Damascus Bronze Co.'s brasses, Harrison dust guards, McCord journal boxes and lids, Acme and Patterson-Sargent paint, arch-bar trucks, and Barber roller side-bearings.

The Mississippi Central, as reported in our issue of December 9, has ordered one 60-ft. baggage and mail car, one first class 52-ft. passenger coach, and 100 flat cars of 80,000 lbs. capacity from the American Car & Foundry Company, for February, 1905, delivery. The flat cars will be 40 ft. long and 8 ft. 9 in. wide. Special equipment includes: Sterlingworth brake-beams, Westinghouse brakes, Tower couplers, McCord journal boxes for flat cars, Safety Car Heating & Lighting Co.'s heating system, for passenger coach, and American Car & Foundry Co.'s wheels.

The Lehigh Valley has ordered 50 low-side gondolas of 100,000 lbs. capacity from the Standard Steel Car Co. These cars will be 37 ft. 10½ in. long, 9 ft. 9 in. wide, outside measurement, and 36 ft. long, 9 ft. 2⅜ in. wide and 4 ft. 10¾ in. high, inside measurement, with steel frames and underframes. Special equipment includes open-hearth steel axles, Westinghouse brakes, Magnus Metal Co.'s brasses, Miner draft rigging, Symington dust guards, journal boxes and journal box lids, Railway Steel-Spring Co.'s springs, M. C. B. automatic couplers, American Steel Foundries' bolsters and Diamond arch-bar trucks.

The Southern Pacific, as reported in our issue of November 25, is building four mail cars at its Sacramento shops. These cars will weigh 94,150 lbs., and measure 60 ft. 7¼ in. long, over end sills; 9 ft. 8 in. wide, over side sills, and 14 ft. $1^{9}/_{16}$ in. high from rail over roof. The special equipment includes: Diamond "Special" brake-beams, Christy flanged Diamond "S" brake shoes, Hewitt brasses, Janney couplers, National Malleable Castings Co.'s journal box lids, Pintsch light, Sherwin-Williams paint, Standard Steel Co.'s platforms, Railway Steel-Spring Co.'s springs, Pullman dummy vestibules and Standard steel tired wheels.

BRIDGE BUILDING.

AKRON, OHIO.—The Baltimore & Ohio, it is reported, will repair many of its bridges on its Cleveland Terminal & Valley division at a cost of about $115,000.

BARRIE, ONT.—A committee has been appointed to make plans and estimate the cost of a steel bridge to be built over the Nottawasaga river near Van Vlack.

BELAIR, MD.—The County Commissioners, it is reported, are asking bids December 19 for building two steel concrete bridges and abutments.

CAMDEN, N. J.—The Pennsylvania, it is reported, is asking bids for improvements on its road from Second street to Cooper creek, which include the building of eight bridges over streets between those points, with long crossing bridges over Haddon avenue, Federal street and Twelfth street. The latter will be 250 ft. long and the one at Haddon avenue 85 ft. long. There will also be a solid roadbed between retaining walls from Haddon avenue to Cooper creek.

CATAWISSA, PA.—Plans have been made to extend the bridge over the river at this place to the corner of Second and Main streets at an additional cost of about $43,000.

CLEVELAND, OHIO.—Bids are wanted January 4 by the Board of Commissioners of Cuyahoga county for building a steel bridge over Tinkers creek in Newburg, and the abutments of a bridge over Big creek in Brooklyn. Julius C. Dorn is Clerk.

DAYTON, OHIO.—An ordinance is before the council authorizing an expenditure of $200,000 for a bridge over the Miami river at Germantown street. The People's Railway Co. will pay one-third of the cost.

FORSYTH, MONT.—Bids are wanted by the County Clerk December 17 for building a bridge in Rosebud County over the Yellowstone river to cost $45,000. Address R. J. Cole at Forsyth.

HARRISBURG, PA.—The Pennsylvania, local reports state, has about completed plans for building an additional bridge over its tracks.

HASTINGS, NEB.—Bids, it is reported, are wanted December 28 by W. H. Davis, County Clerk, for building all the bridges that may be needed in Adams County in 1905.

INDIANAPOLIS, IND.—Separate bids are wanted December 17 by the Board of County Commissioners for building two bridges in Perry, one in Washington, one in Wayne and two in Lawrence townships in Wayne County. John E. McGaughey is a commissioner.

MACON, GA.—An ordinance is before the City Council providing for building a steel viaduct over the tracks at Seventh street 32 ft. wide with a roadway of 20 ft. and 6 ft. sidewalks, to be built under the supervision of the City Engineer.

MADRID, IOWA.—The bridge over the tracks of the Chicago, Milwaukee & St. Paul is to be rebuilt at once.

MILWAUKEE, WIS.—The Common Council committee on bridges and viaducts has decided to reject the proposition of the Milwaukee road to pay $125,000 toward the cost of building a new viaduct at Sixth street and First avenue provided it should be released from elevating its tracks on the south side.

MONTREAL, QUE.—Bids are wanted December 20 by L. K. Jones, Secretary of the Department of Railways and Canals at Ottawa, for building the substructure of the Atwater avenue bridge.

NEWKIRK, OKLA. T.—H. B. Davis, Deputy County Clerk, it is reported, is receiving bids December 19 for building 12 steel bridges in Kay County.

NEW YORK, N. Y.—Bids are wanted December 22 by Commissioner of Bridges George E. Best for building the Manhattan and the Brooklyn anchorages of the Manhattan bridge.

SACRAMENTO, CAL.—The plans of the Southern Pacific, it is reported, have been submitted to the War Department for approval for building a bridge over the Carquinez straits from the Nevada dock to Fifth street, Benicia. The proposed structure will be a bridge more than a mile long with a draw. A bridge at this point would reduce the running time between San Francisco and Sacramento 30 minutes.

SIOUX CITY, IOWA.—The City Council is considering the ordinance authorizing the building of a viaduct over Wall street, and plans are being prepared by the City Engineer.

SPRINGFIELD, OHIO.—The wooden bridge over the tracks on South Factory street will be replaced by a new structure.

TRAER, IOWA.—The Chicago & North Western, local reports state, is building a 500-ft. railroad bridge over Twelve-mile creek north of this place.

Work will be begun at once on a bridge over the Iowa river six miles west of Solon, to cost about $9,000.

VERMILION, S. DAK.—Bids are wanted January 4 by L. B. Bridgman for building all the bridges in Clay County that may be needed in 1905.

WILLIMANTIC, CONN.—This city has voted $12,000 to build a bridge over the railroad tracks.

Other Structures.

ALEXANDRIA, VA.—The Washington Southern, reports say, has plans ready for a new brick passenger station 25 x 70 ft.

BROOKLYN, N. Y.—Plans are under way for improvements to the various stations of the Fifth Avenue & Bay Ridge elevated lines of the Brooklyn Rapid Transit Co. It is said that work will be commenced at once, and that the whole will cost about $250,000. The union station at Thirty-sixth street will be enlarged and large shops and storage yards will also be built at that place.

COLUMBIA CITY, IND.—Local reports state that the Pennsylvania has plans ready for putting up a new brick passenger station to cost $18,000.

EMERSON, MAN.—Arrangements, it is reported, have been completed by the Canadian Pacific, the Great Northern, the Canadian Northern and the Minneapolis, St. Paul & Sault Ste. Marie for building a new union passenger station 140 ft. x 60 ft. The plans provide for a joint office building for the Canadian Northern and the Canadian Pacific on the Canadian side, and for the Great Northern and the Minneapolis, St. Paul & Sault Ste. Marie on the American side. It will also contain quarters for the Canadian and United States Customs officials with bonded warehouses adjoining, the work to be done under the direction of the Great Northern. The contract has been given to J. Ward, of Minneapolis, which calls for the completion by March 1.

KANSAS CITY, MO.—The Missouri Pacific, it is reported, has decided to put up a brick station at the Soldiers' Home near Leavenworth, to cost $12,000, to replace the present frame structure.

MENASHA, WIS.—The Wisconsin Central and the Chicago, Milwaukee & St. Paul, it is reported, are planning to jointly build a new union station.

NEW ORLEANS, LA.—Plans are being made for building the Illinois Central fruit wharf from Thalia to Calliope street at a cost of $60,000, and placing steel sheds on the dock at an additional cost of $60,000.

PRINCETON, IND.—According to local reports, the Southern has given a contract for putting up a new machine shop 90 x 232 ft., a building for storage 45 x 85 ft., and an addition to the paint shop 35 x 40 ft. to cost about $35,000.

SHAWNEE, OKLA. T.—According to reports, the Rock Island is planning to spend a large amount of money in shop improvements at this place; also to put up buildings for offices.

RALEIGH, N. C.—The Seaboard Air Line, it is reported, will spend $50,000, of which $25,000 will be used for a new freight house and $25,000 in yard improvements.

ROCKY MOUNT, N. C.—The Atlantic Coast Line, reports say, is building additions to its shops to double their capacity.

TREMONT, ILL.—The Cleveland, Cincinnati, Chicago & St. Louis, it is reported, is asking bids February 6 for putting up a brick and stone passenger station.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTA, KNOXVILLE & NORTHERN.—Work is now in progress rebuilding the first 60 miles of this line extending south from Knoxville, Tenn., to Etowah, Tenn. The changes being made are so extensive as to make practically a new roadbed for the entire distance. Grading is being done by W. J. Oliver & Co., of Knoxville. Track laying will probably be begun in March and completed by July, 1905. Grading is also in progress on 87 miles of new line extending from Etowah, Tenn., to Cartersville, Ga., where connections will be made with the Western & Atlantic, and with the Seaboard Air Line. The last mentioned work is being done by Wright, Williams & Wadley, of Birmingham, Ala. The track laying will probably be begun in May or June, 1905, and completed before the end of the year. (Official.)

ATLANTIC, QUEBEC & WESTERN.—An extension of time for a year is being asked for commencing work on the proposed lines of this company in Gaspe county, Quebec. The company was to have commenced work on two sections of 10 miles each, one on the coast to connect with the Atlantic & Lake Superior, and the other through the center of the county to connect with the Intercolonial at Causapscal, Que.

BALTIMORE & OHIO.—During the calender year of 1904, the construction department of the Baltimore & Ohio has changed 29.35 miles of track; built 55.4 miles of new road, and 86.35 miles of second track. This work includes the building of the Point Pleasant, Buckhannon & Tygart's Valley from Lemley Junction to Buckhannon, W. Va., 12.6 miles; a second track between New Castle Junction and Strouthers, Ohio, 14.2 miles, and from Haselton to Niles, Ohio, 8.5 miles.

From Niles, Ohio, to Cuyahoga Falls, 42.8 miles, an entirely new double track line has been built, and changes of alinement and grades have been made between Flushing, Ohio, and Fairport, Ohio, 11.27 miles, and between Barton and Bridgeport, Ohio, 9.15 miles. All of this work is practically completed, although some of it will not be in use before January 1. (Official.)

BAYFIELD, LAKE SHORE & WESTERN.—An officer writes that work is now in progress on this road between Racket Creek, Wis., and Cornucopia, seven miles. H. M. Juel is the contractor. Preliminary surveys are also in progress from Cornucopia to Port Wing, 18 miles. W. B. Westcott, Bayfield, Wis., may be addressed. (October 21, p. 133.)

BUCKHANNON & NORTHERN (WABASH).—This company is reported to have resumed work on its line which was located in 1902 from New Brownsville, W. Va., to Bellingham, 85 miles. Work has been suspended for over a year owing to legal difficulties with the Baltimore & Ohio; but these difficulties have now been decided in favor of the Wabash. (July 1, p. 23.)

BUFFALO & ROCHESTER (ELECTRIC).—This company has been incorporated in New York to build and operate an electric railroad from Depew, in Erie county, to Rochester, 60 miles. The principal office is at Depew, and the capital is $3,000,000. H. H. Kingston, J. A. Harris, Jr., J. J. Collier, H. A. Foster, T. H Dixon and S. Welsh, of Philadelphia, and W. B. Cutter, G. A. Ricker and H. P. Bissell, of Buffalo, N. Y., are incorporators.

CANADA-MIDDLESEX.—Application will be made at the next session of the Dominion Parliament for a charter for this company to build a railroad from the Niagara river to London, Ont. Chryster & Bethune, Ottawa, Ont., are acting for the promotors.

CHICAGO, BURLINGTON & QUINCY.—This company is building new freight yards at East Des Moines, Iowa. The yards will extend from East Fourth street to East Tenth street. Heretofore the company has only had a loading track on the east side; but with the recent extension of its Burlington & Oskaloosa division into Des Moines, this track has been over-crowded. The east side yards will be used largely for making up, while the west side yards will be devoted entirely to storage purposes.

An officer writes that this company is putting in a number of passing tracks on its line between Akron, Colo., and Lincoln, Neb., but is not double tracking its line between these points, as reported in the newspapers.

COLUMBIA RIVER & OREGON CENTRAL (OREGON R. R. & NAVIGATION CO.).—An officer writes that work is now in progress on an extension from Arlington, Ore., to Condon, 45 miles. The contractor is the Pacific Coast Construction Co., of Portland, Ore.

DENVER, NORTHWESTERN & PACIFIC.—An officer writes that this company has completed its line as far as Arrowhead, Colo., 59 miles from Arena. Work is now in progress on a further extension to Hot Sulphur Springs, 33 miles. The contractors are Orman & Crook and Dunphy & Nelson, of Fraser, Colo. Location surveys are also in progress for an eventual extension of the line from Hot Sulphur Springs, Colo., to Provo, Utah, 394 miles. H. A. Sumner, 717 Majestic building, Denver, Colo., is Chief Engineer.

DONALDSONVILLE & NAPOLEONVILLE.—An officer writes that this road has been finished and opened for traffic between Donaldsonville, La., and Napoleonville, 15.7 miles. Location surveys have also been completed for extensions from Johnson, La., to Honma, 40 miles; and from Thibodaux to Gibson, 16 miles. Contracts for grading these lines will be let about January 1. M. D. Bringier, Donaldsonville, La., is General Manager. (July 29, p. 47.)

DURANGO, ALBUQUERQUE & GULF.—Articles of incorporation have been filed by this company in New Mexico. It is proposed to build a railroad 200 miles long through Bernalillo, McKinley and San Juan counties in New Mexico and LaPlata County in Colorado. W. H. Andrews, and W. S. Hopewell, of Santa Fe, N. Mex., are named as incorporators.

GREAT NORTHERN (CANADA).—Permission will be asked at the next session of the Dominion Parliament to build a line from Grand Mere to Quebec City, and for a branch line to the Quebec bridge. Permission will also be asked to purchase the Chateaugay & Northern, and the Quebec, New Brunswick & Nova Scotia railroads.

HELM & NORTHWESTERN.—We are reliably informed that this company which was recently incorporated in Mississippi is an independent corporation and not associated with the Yazoo & Mississippi. The proposed route is from Helm to Arnold, 22 miles, and the purpose of the line is to develop a local territory where there are a number of saw mills. M. Gilleas, Memphis, Tenn., is President. (November 25, p. 168.)

JAMES BAY.—Application will be made to the Dominion Parliament next session for power to build a line from the mouth of French river, on Georgian Bay, through Ottawa to Montreal, and for a line from a point north of Toronto via Ottawa to Montreal. The James Bay is now under the management of Mackenzie & Mann, the owners of the Canadian Northern.

KENTUCKY MIDLAND.—This road has been surveyed from Madisonville, Ky., southeast to Central City, 26 miles. Grading will be begun by this company's forces about January 15. The work will be light, with a maximum grade of 1½ per cent., and a maximum curvature of .6 per cent. M. M. Wheeler, Earle's, Ky., is Chief Engineer. (September 30, p. 111.)

KNOXVILLE, LAFOLLETTE & JELLICO (L. & N.).—An officer sends the following information about work completed in 1904, and work now in progress. The Knoxville, LaFollette & Jellico has opened its main line from Saxton, Ky., 198 miles south of Louisville, to Knoxville, Tenn., 78.8 miles. Work has also been finished on the Cow Creek branch and loading spurs 13 miles long, extending from Dossett, via Oliver Springs into the coal fields north of the latter point, and on the Clear Fork Branch, 6.1 miles, from Holton, on the main line, up the Clear Fork Branch to coal fields.

LOUISVILLE & NASHVILLE.—An officer sends the following information relative to construction work on this company's lines during 1904, and prosposed work in 1905. In the Birmingham district the Cain Creek branch of the North Alabama, consisting of 29.05 miles of main track and 14.24 miles of subordinate branches, has been finished, and is now in operation. This branch leaves the main line of the South & North Alabama at Black Creek, Ala., eight miles north of Birmingham, and runs in a westerly direction to Banner, Ala., and Sayre, Ala., on the Warrior river. The extension of the Oneonta & Attalla from Altoona, Ala., to a connection with the N., C. & St. L. at a point 1½ miles west of Attalla, Ala., 15.56 miles, is completed with the exception of the tunnel at Tumlin Gap through Blount Mountain, and this will be finished in the spring of 1905. The Turkey Creek branch, diverging from the main line of the South & North Alabama at Fedora, Ala., 18 miles north of Birmingham, and extending in an easterly direction up Turkey Creek 2.95 miles to reach coal mines at Indio, Ala., has been built during 1904. The Graves branch, which leaves the Birmingham Mineral at North Birmingham, Ala., has been built in a northerly direction, 2.62 miles, to Graves' mines. The Boyle's Gap branch, 2.08 miles in length, built during the year, leaves the Graves' branch at North Birmingham, and extends in a northeasterly direction to a connection with the South & North Alabama near Five Mile Creek. The Deming branch, 1.73 miles in length, diverging from the Birmingham Mineral at Mattawana, Ala., and running in a westerly direction to stone quarries at Deming, Ala., is also in operation. During the year 5.63 miles of second track from Decatur, Ala., to Flint, Ala. At Boyles, Ala., additional yards and roundhouse were built, representing 20.88 miles of additional track. On the Cumberland Valley Division, between Middlesborough, Ky., and Norton, Va., a branch line is now being built diverging from the main track at mile post 198 from Louisville, Ky., crossing the Cumberland river, and extending for a distance of 2⅛ miles into coal property of the Bell Jellico Coal Company. Grading on this line has been finished and track laid for a distance of 3,000 ft. to the river. A branch known as the Pennington Gap Line, connecting with the Cumber-

land Valley Division at Pennington, Va., and extending up Powells river to coal lands of the Black Mountain Coal & Coke Company, seven miles, is graded and track laying is in progress.

MINNEAPOLIS & ST. LOUIS.—It is officially denied that this company has begun work on 11 miles of road between Ruthven and Terril, Iowa. A connecting track with the C., M. & St. P. has recently been put in at Spencer, Iowa.

MISSOURI, OKLAHOMA & GULF.—Press reports state that this company will build 375 miles of railroad, mostly in Indian Territory, early in 1905. The company has bought and will complete the Muscogee Union, a short line connecting Muscogee, Ind. T., with the Missouri Pacific at Corretta, 12 miles north, and a projected line to Texas, now building, 43 miles of the grade of which has been completed and is ready for the steel. The new line to Texas runs from Muscogee to Henrietta, where it crosses the Frisco, thence to Spokogee, crossing the Fort Smith & Western, and thence to the Red river, which it will cross at Denison. Surveys are now in progress for an entirely new line from Muscogee northeast to Joplin, where the Missouri, Oklahoma & Gulf will make a connection with some line running into Kansas City. This new line from Muscogee will run west of the Grand river, across the Missouri Pacific six miles east of Wagoner, strike the Missouri, Kansas & Texas at Pryor creek, cross the Frisco either at Alton or Fairland, and thence on to Joplin. Construction will begin in April. The line from Joplin to Denison will be 310 miles long. The company has also authorized the construction of a line from Henrietta, Ind. T., where a junction with the Frisco is made to Shawnee, Okla., a distance of 65 miles. William Kenefick, Kansas City, Mo., is President.

NEW YORK, NEW HAVEN & HARTFORD.—The State Railroad Commissioners have approved the plans of this company for widening its roadbed from New Haven to Cedar Hill so that it will accommodate four tracks instead of two as at present. The estimated cost of this improvement is $1,000,000.

PENNSYLVANIA.—Work will soon be begun on the elevation of the tracks of this company through Camden, N. J., along Bridge avenue. Bids have already been asked on that portion of the work extending from Second street and Haddon avenue and thence along the Amboy division to Cooper's creek. The work will necessitate the building of eight bridges.

PITTSBURG, SUMMERVILLE & CLARION.—This company, which completed a line from Summerville, Pa., to Clarion, 16 miles, last August, has recently opened a branch from Strattonville to Mill Creek, three and a half miles. Location surveys are now being made for an extension of this branch from Mill Creek to Hallton, 36 miles. C. F. Heidrick, Clarion, Pa., is President. (September 2, p. 80.)

SHAWNEETOWN & ROSECLAIR.—This company has been organized in Illinois with an authorized capital of $1,000,000 to build a railroad from Roseclair, in Hardin County, to Shawneetown, 32 miles. W. H. Swift, St. Louis, Mo., is President: S. G. McWade, Shawneetown, Ill., Vice-President, and George Hanton, Secretary.

WASHINGTON CENTRAL.—Articles of incorporation have been filed by this company in Washington. The authorized capital is $500,000. It is proposed to build a railroad from a point near Grays Harbor, in Chehalis County, Wash., in an easterly direction through Chehalis, Lewis, Thurston and Yakima counties. G. E. Long, M. D. Sayles, L. E. Crouch, of Portland, Ore., and E. V. Bloomfield, Centralia, Wash., are named as incorporators.

WESTERN PACIFIC.—According to press reports, contracts for building this proposed road from Salt Lake City to San Francisco will soon be let. President W. J. Barnett, of San Francisco, is quoted as saying: "After two years of preliminary work we have decided to adopt the route through Beckwith Pass, crossing the Sierra Nevada Mountains on a line 1,000 ft. lower than that of the Central Pacific." E. T. Jeffery, President of the Denver & Rio Grande, has been elected Vice-President of this company.

RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—Announcement has been made by the directors that a special meeting of the stockholders will be called on January 28 to authorize an issue of bonds to provide for future capital requirements. The total authorized issue will be $50,000,000 of bonds convertible into common stock. In order to provide for this conversion, it will be necessary to authorize also an increase in common stock from $102,000,000 to $152,000,000. It is proposed to issue at first only a part of the authorized $50,000,000 convertible bonds and to offer them to the stockholders pro rata for subscription on terms to be hereafter announced. The proceeds from the sale of these bonds will be used for the completion of lines already under construction, for additional branches and for new equipment.

BOSTON & WORCESTER STREET RAILWAY.—E. H. Gay & Co., 1 Nassau street, New York, are offering $250,000 4½ per cent. first-mortgage 20-year gold bonds of this company. These bonds are part of an authorized issue, of which $1,450,000 are already outstanding.

MISSOURI PACIFIC.—Kuhn, Loeb & Co., New York, have recently bought $25,000,000 4½ per cent. 40-year gold bonds. These bonds are secured by stock of the St. Louis, Iron Mountain & Southern, and are a collateral trust issue. The proceeds from the sale of the bonds will be used to pay for improvements on various lines and to refund the $6,000,000 outstanding 5 per cent. collateral trust notes.

NEW YORK, NEW HAVEN & HARTFORD.—The property of the Providence & Stonington Steamship Co. in Providence has recently been formally transferred to the New England Navigation Co. The New England Navigation Co., of which Charles S. Mellen is President, is the name under which all the steamboat lines operated in conjunction with the N. Y., N. H. & H. have now been merged.

NEW YORK, ONTARIO & WESTERN.—At a meeting of the directors held on December 7, a dividend of $3 a share (3 per cent.) was declared on the common stock, payable January 16 to holders of record December 22. This dividend is made in accordance with the plan agreed upon when the control of the company was recently purchased by the New York, New Haven & Hartford.

NORFOLK & SOUTHERN.—Deeds have recently been filed by this company in Norfolk, Va., denoting the purchase of the Chesapeake Transit Co.'s electric line from Norfolk to Cape Henry. A mortgage for $10,000,000 has been authorized, of which $4,000,000 will be issued at once. The proceeds from these bonds will be used for improvements at Cape Henry, for electrifying the Norfolk & Southern main line and for standard gaging the Washington and Plymouth, N. C., divisions.

SOUTHERN PACIFIC.—A dividend of 3½ per cent. has been declared on the $40,000,000 of 7 per cent. preferred stock, payable on January 16 to stockholders of record December 31.

WHEELING & LAKE ERIE.—Rudolph Kleybolte & Co., Cincinnati, New York and Chicago, are offering for sale an unsold portion of an issue of $510,000 equipment trust 4½ per cent. notes payable at the rate of $51,000 annually beginning Dec. 1, 1905. A circular says: "These notes are issued for 85 per cent. of the cost of new equipment consisting of 1,000 coal cars, 15 per cent. having been paid in cash. They are a first lien on the equipment purchased.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

FRIDAY, DECEMBER 16, 1904.

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